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CONTENTS.

All communications to be addressed:

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POINTS FOR PRODUCERS.

English Apple Market.

The first shipment of Californian apples arrived on the market this week, says the Trade Commissioner, in his report dated October 5th. The consignment comprised boxed and barrelled fruit, first, second, and third grade, and the varieties were confined principally to Gravenstein, Emperor, New Town Pippin, and Ribstone Pippin. The shipment landed in very good condition, and the better varieties in cases are making from 11s. 6d. to 12s. per box, with barrels realising from 24s. number ones, 18s. to £1 number twos, and 15s. to 16s. number threes. The cased apples are all wrapped with a much heavier paper than that which is used in South Australia, but contain no wood wool. The apples carry splendidly, and show no signs of bruising. This is due to a very large extent to the use of heavier paper. The cases also are different in shape from the South Australian. An interesting feature is that, without exception, each consignor uses paper labels. The shippers are practically all co-operative societies, and the uniformity of grading, packing, and get up generally is remarkably good. The barrelled apples are unwrapped, and have no packing whatever to protect them from the sides of the barrel. They are pressed into the barrels with some considerable force before being headed up.

Ringing Fruit Trees.

With the object of testing the value of ringing (*i.e.*, removal of a complete ring of bark) fruit trees with respect to their productiveness, experiments were carried out during 1910-1913 at the New York Agricultural Experimental Station with apple, pear, plum, and cherry trees. The results showed, according to the Bulletin of the International Institute of Agriculture, that under certain conditions ringing may induce and possibly increase fruitfulness of apples, but it rarely has these favorable effects on other fruits. The removal of narrow strips of bark is less injurious to plant growth than taking out wide rings. The practice should never be followed with stone fruits, and only on young and very vigorous apple trees. The operation had no effect on the size, color, or maturity of the apples, and the roots were diminished in size and vigor. This practice has received attention in South Australia, and the Horticultural Instructor (Mr. Geo.

Quinn) states that in the case of oranges a noticeable improvement in the bearing followed ringing. Australian navels, which are notoriously bad in setting their fruit, when treated in this manner, were found to produce crops of exceptionally large thick-skinned oranges. In fact, in one instance it was found that 28 fruits from trees that had been treated to the ringing process completely filled a one-bushel case.

South Australian Soldiers' Fund.

Among the resolutions passed by the last congress of the Agricultural Bureau is one that will commend itself to all farmers in South Australia. At that gathering unanimous assent was given to a proposal that every Agricultural Bureau member should set aside a definite acreage of the coming harvest, the proceeds from which should be devoted to the South Australian Soldiers' Fund. Last year a similar arrangement resulted in a considerable sum being donated for the relief of the Belgians. There is every reason to expect that the response this year will be as ready. The duty of Australia to those who have taken their place in the battle front is paramount, and this appeal, coming from the farmers themselves, will be responded to with that enthusiasm which it warrants.

Imports of Plants, Fruit, Etc.

During the month of October, 1916, 1,320bush. of fresh fruits, 18,536bush. of bananas, 17,689 bags of potatoes, 830 bags of onions, 570pkgs. of vegetables, 129pkgs. of plants, trees, etc., were examined and admitted at Adelaide and Port Adelaide under the "Vine, Fruit, and Vegetable Protection Acts of 1885 and 1910"; 168bush. of bananas and 13bush. of oranges (over ripe) were destroyed, and 57bush. of oranges were fumigated. Under the Federal Commerce Act 315bush. of fresh fruit, 11,709pkgs. of dried fruit, and 15pkgs. of preserved fruit were exported to oversea markets. These were consigned as follows:—For London, 5,620pkgs. of dried fruit; for New Zealand, 315 cases of citrus fruit, 1,710pkgs. of dried fruit; for Vancouver, 4,375pkgs. of dried fruit; for India, 15pkgs. preserved fruit and 4pkgs. of dried fruit. Under the Federal Quarantine Act 808pkgs. of plants, trees, bulbs, etc., were examined and admitted from oversea sources; 15lbs. of Soya beans from United States of America were cleaned at the Plant Quarantine Depot on account of the presence of proclaimed weed seeds.

Horses and Harvest.

With the advent of the harvest, it is well to remind farmers that there are several little points in connection with the management of horses that cannot be neglected with impunity. A too frequent practice is to keep the harvester working too late at night to enable the horses to dry off and rest properly before the next day's work, as a result of which occur digestive troubles, and

also rheumatic lamenesses. It is also advisable to let the animals have a drink in the middle of the day, even if it is not a full drink and has to be carted out to them, says the Veterinary Lecturer. In cases where this is neglected there is a danger of the animals drinking to excess when the day's work is done, and as a result digestive derangement, including stoppage and colic, may result.

Pigs.

That the pig is naturally a grazer is too frequently overlooked, and neglect to bear this fact in mind is at times responsible for loss. This point was emphasised by the Veterinary Lecturer (Mr. F. E. Place, B.V.Sc., M.R.C.V.S.) in replying to a correspondent who reported that a young boar was troubled with constipation, straining, and protrusion of the bowel. The condition of the animal varied, better, then worse, for a week, and it finally died after a cold night. *Post mortem* inspection revealed congestion of all organs, especially bladder and liver, in which were gritty lumps. The trouble was that the pig was killed by kindness, otherwise acute indigestion complicated by worms in the liver—the gritty nodules—said Mr. Place. Pigs are naturally grazers, and young pigs confined and stuffed sometimes give out in this way. A little—an ounce or two—of Epsom salts occasionally in the food, or a similar quantity of sulphur, in addition to the charcoal will generally keep matters right. In acute cases such as this a tablespoon of glycerine given as an enema will afford relief.

Publication Received.

"Nature in Farming," a discussion of scientific principles in their relation to farm practice, by John W. Paterson, B.Sc., P.L.D., Professor of Agriculture in the University of Western Australia.—Lothian Book Publishing Coy. Proprietary, Limited, Melbourne.

DESTROYING CATERPILLARS.

A number of caterpillars belonging to a species of the cutworm moth were forwarded by a correspondent for identification, and advice as to a means of effecting their destruction. The Horticultural Instructor, in replying, said the pests might be poisoned either by spraying the trees or plants with arsenate of lead, using about an ounce to the gallon of water, or by making a bran and paris green mash in the proportion of an ounce of paris green to 2lb. of bran, using enough dissolved molasses or brown sugar in the hot water to make it into an adhesive mash. That was placed about the trees or plants on the ground in small lumps, and the caterpillars displayed a great partiality for it. The poison might be sown over beds of onions and similar vegetables which were attacked by the pests.

INQUIRY DEPARTMENT.

Any questions relating to methods of agriculture, horticulture, viticulture, dairying, &c., diseases of stock and poultry, insect and fungoid pests, the export of produce, and similar subjects, will be referred to the Government experts, and replies will be published in these pages for the benefit of producers generally. The name and address of the inquirer must accompany each question. Inquiries received from the question-boxes established by Branches of the Agricultural Bureau will be similarly dealt with. All correspondence should be addressed to "The Editor, *The Journal of Agriculture*, Adelaide."

VETERINARY INQUIRIES.

[Replies supplied by Mr. F. E. PLACE, B.V.Sc., M.R.C.V.S., Veterinary Lecturer.]

[Extraordinary pressure on space has rendered it necessary to very considerably urtail the inquiry department. Replies to those questions of more general interest only have been published; however, every query received has been replied to through the ost.—ED.]

"D. & E. M.," Mundalla, advise that a cow suddenly went off milk and ppetite, fidgetty when being milked; dung rather dry.

Reply—The symptoms point to that form of digestive paralysis often called ry bible, and it would be well to give her a daily dose of a pint of yeast in a uart of milk, and if possible, to change her pasture and put her on lucerne or imilar feed. After three days give her twice a day 30 drops tincture bryonia n a little water for a week, and then 30 drops tincture nux vomica twice daily for week.

"J. C. F.," Koonibba, reports a cow, restless and irritated udder, then blotches ppear on udder and teats; seem to work out to skin, crack, and go into a big scab.

Reply—A good description of cowpox, which is highly infectious both to cows nd human beings. Give the cows a teaspoonful of cream of tartar, or as much s will lie on a 3d. bit of tartar emetic once or twice a day for a few days. Dress he teats after milking with boracic ointment, strength 1 to 4, and then paint them ver with collodion, or what is cheaper and just as effective, oak varnish and castor il in equal parts. Only handle the affected ones after finishing the healthy, and lways wash the hands after with a disinfectant soap.

"Reject," Curramulka, reports that a draught colt 14 months, died three days fter castration, bled a little after operation, not alarmingly; left testicle difficult hold. P.M.—Abdomen full of blood and leak in right artery, the end of which s with the left, was properly closed, there was slight swelling of both right and ft vessels at point where leak occurred.

Reply—This was a case of aneurism, and the most common cause of the trouble verminous, possibly months before the operation. The death could not have been reseen or prevented, and as the internal hæmorrhage could only be surmised om the increasing weakness and pallor of the eyes little could have been done. eally hot fomentations of the loins and the administration of 10 drops of tinc- re arnica every three hours may be of use.

"Reject" Curramulka, states that a colt, four or five hours after castration, arted to drop blood about 60 drops per minute, and kept on for some hours.

Reply—The bleeding in this case was venous, and probably arose from some rtion on the colt's part about the time it commenced. Unless more than three rts are lost it is not necessary to take any measures, but if there if a weak se and signs of collapse before that it is as well to give arnica as mentioned previous reply, and possibly to stuff scrotum with a wad of tow soaked in a per cent. solution of the same. As a rule more damage is done by exciting the e than by waiting, but each case has to be treated on its merits.

"A. S.," Wollowa, has a horse with heel broken off.

Reply—The best way of treating this will be to bandage with Stockholm tar and bran bag, changing about once a fortnight till the hoof grows down about 1in., then tar only.

"W. E. B.," Riverton, has a cow, third calf, with lump at top of teat.

Reply—There is an abscess, and it would be well to open it; it will become fibrous and stop the passage altogether. A teat syphon will enable you to get the milk temporarily, but it would seem that an operation is necessary to cure. A lotion of a teaspoonful of boracic acid in a pint of warm water will be the best dressing. Do not use the milk from that quarter until it has been boiled, even for pigs. The cheapest course will be to let that quarter dry off.

"G. E.," Mildura, has foal with soft lump in scrotum.

Reply—This is probably scrotal hernia (rupture), leave till two years before castrating, but if very bad, as big as a wheelbarrow, operate now by covered method, do not cut inner skin (*tunica vaginalis*) but sew up after removal of testicle; dissect skin, make a truss of wool and keep in position till well. In many cases the trouble disappears during the first year.

"G. F.," Gumeracha, has a foal three weeks, with crooked leg.

Reply—The leg will in all probability straighten as the foal grows; if not the local blacksmith would be able to make a light splint out of hoop iron; this should not be resorted to too early. A teaspoon of syrup of phosphate of iron (Parrish's food) twice a day would probably help matters.

"T. S.," Blanchetown, reports that a cow has difficulty in chewing.

Reply—As she is young the teeth are probably in fault; gag her mouth open with a billet of wood and feel them. Probably temporary shells have to be taken off, which can be done with the fingers. Have a good billet, a young cow can bite hard.

"H. N. G.," Jabuk, reports that a foal swelled up after birth, shivered, fell, exerted, and recovered.

Reply—Before an animal breathes there is a valve in the heart (*foramen ovale*) which acts as a by-pass for the blood. As soon as separate existence is set up this should close. In this case it did not for some days. There will not be any bad effects, and no treatment is necessary. The oil given was helpful.

"Rusticus," Salisbury, has a young horse, first season work, lump on point of shoulder.

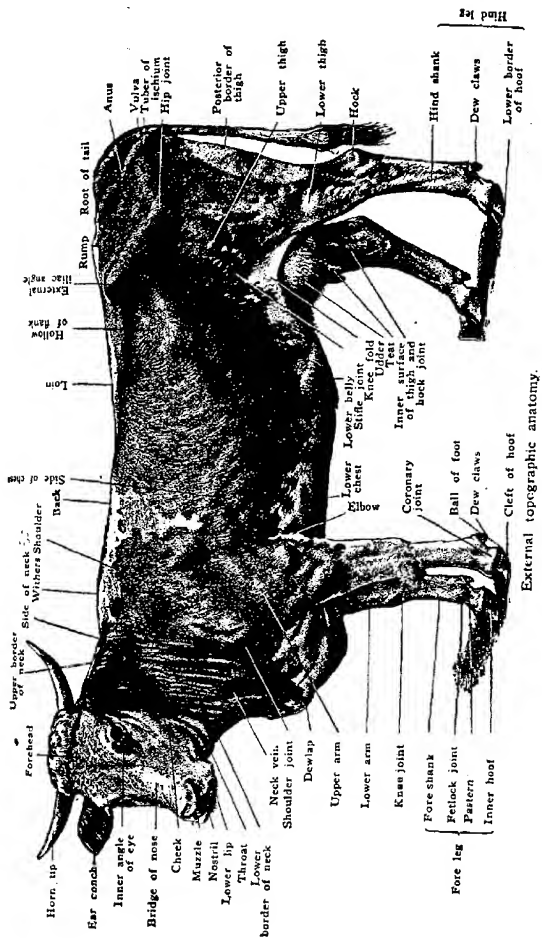
Reply—The lump is suggestive of a serous swelling, due to a misfitting collar. Drive a knife into the lower hindpart of it, and see what comes out. Dress it three times a day with lotion made of 1oz. tincture arnica to 1 pint methylated spirit. If you would like the Veterinary Lecturer to see it and advise, if you will communicate with him he will arrange to do so one day when returning to town from a northern trip.

"W. H.," Wilmington, states that ponies go stiff on ripening feed, and muscles of neck become very hard.

Reply—The condition is due to the character of the feed, and it would be well to feed wet bran freely as well. Give 10 drops of tincture rhus toxicodendron morning and evening for a fortnight, and rub the muscles daily with a liniment composed of equal parts strong ammonia, vinegar, camphor, methylated spirit, and white of egg, with a dram of tincture rhus tox. to the 6ozs. of liniment.

"R. S. K.," Petersburg, reports a bay buggy pony lame in off hind at walking, on rough road carries leg like a lame dog for a while, on turning round sharply goes lame for a few steps. No heat or pain or swelling about leg.

Reply—The symptoms so carefully observed and well described enable one to say almost definitely that the pony is suffering from spavin, a bone disease of the hock, which is difficult for an amateur to see or detect. If this is the case the trouble is permanent, and treatment only palliative, not curative; but as the disease progresses the joint becomes permanently stiff, and so the lameness is not noticeable. If desired you may blister the inside of the hock joint with a blister once every three weeks, spelling in the meantime.



External topographic anatomy.

ROSEWORTHY AGRICULTURAL COLLEGE.

SIXTH REPORT ON THE PERMANENT FIELD EXPERIMENTS, SEASONS 1904-1915.

[By WALTER J. COLEBATCH, B.Sc., M.R.C.V.S., Principal, Roseworthy Agricultural College, and R. C. SCOTT, Assistant Experimentalist.]

(Continued from page 276.)

2. NITROGENOUS FERTILISERS.

In contradistinction to phosphates, nitrogenous fertilisers exert more influence on the vegetative development than on the formation and maturation of the grain, and it is a reasonable supposition, therefore, that any benefits accruing from nitrogenous applications will be more pronounced in hay crops than in crops harvested for grain.

In connection with nitrogenous fertilisers, consideration of residual effects is not called for, as the soil possesses little, if any, retentive powers for nitrogen, any excess over and above the crops' requirements being discharged in solution in the effluent waters.

Trials of a temporary character have been repeated from time to time with various kinds of nitrogenous manure in various parts of the State, and nearly always with negative results, although in some of the lighter districts applications made at the end of the winter have in some seasons completely transformed the color and general character of backward wheat crops. Of the nitrogenous manures available to us, namely, nitrate of soda, sulphate of ammonia, nitrate of lime nitrolem, and dried blood, the two most generally used—nitrate of soda and sulphate of ammonia—have been submitted to investigation in the Roseworthy system of permanent experiments.

(*a*) NITRATE OF SODA.

This is one of the most costly manures in the market, and for that reason, as well as on other grounds, it is highly important that the correct amount to apply should be determined within narrow limits The lowest amount per acre included in our trials is 28lbs., and the highest is 1cwt. There is also a ½cwt. plot, a 1cwt. plot applied in the autumn, and a 1cwt. plot in which the phosphatic dressing is raised to 3cwt. per acre. For the sake of clearness, therefore, we will discuss this subject in three sections:—

(1) Quantitative experiments.

(2) Effect of increased phosphatic dressing.

(3) Season at which manure should be applied.

The quantitative experiments to be considered comprise trials with ¼cwt., ½cwt., and 1cwt. of nitrate of soda, applied in the autumn in conjunction with the usual 2cwts. of superphosphate per acre. The following are the results:—

TABLE XXIV.—*Showing Returns from Wheat Dressed with Superphosphate and Nitrate of Soda Comparatively with those from Wheat Dressed with Superphosphate alone*, 1905-15.

Years.	GRAIN YIELDS.				TOTAL PRODUCE YIELDS.					
	2cwts. of Superphosphate.		2cwts. Superphosphate and 1cwt. of Nitrate of Soda.		2cwts. of Superphosphate.			2cwts. Superphosphate and 1cwt. of Nitrate of Soda.		
	Bush.	lbs.	Bush.	lbs.	T.	C.	L.	T.	C.	L.
1905	32	12	36	1	3	3	107	3	4	107
1906	20	48	22	27	2	1	64	2	3	44
1907	20	48	20	29	1	7	108	1	8	95
1908	29	27	33	26	2	9	58	2	15	8
1909	28	1	34	45	2	9	66	3	2	61
1910	24	53	25	48	2	12	65	2	16	22
1911	11	43	21	10	1	5	45	1	16	62
1912	20	34	20	14	1	10	84	1	10	76
1913	6	29	6	14	0	12	96	0	12	37
1914	6	22	6	24	0	8	63	0	6	88
1915	28	42	29	25	2	7	18	2	11	64
Means	20	54	23	18	1	17	28	2	0	91
Means— Hay equivalent	—		—		2	5	48	2	9	86

TABLE XXV.—*Showing Results from Wheat Dressed with ¼cwt. of Nitrate of Soda and 2cwts. Superphosphate, Comparatively with Wheat Dressed with 2cwts. Superphosphate alone*, 1906-15.

Years.	GRAIN YIELDS.				TOTAL PRODUCE YIELDS.					
	2cwts. of Superphosphate.		2cwts. Superphosphate and ¼cwt. of Nitrate of Soda.		2cwts. of Superphosphate.			2cwts. Superphosphate and ¼cwt. of Nitrate of Soda.		
	Bush.	lbs.	Bush.	lbs.	T.	C.	L.	T.	C.	L.
1906	20	49	20	51	2	11	60	2	3	108
1907	14	58	17	48	0	19	13	1	3	10
1908	38	20	37	46	3	1	111	2	18	32
1909	31	2	33	40	2	15	66	2	11	49
1910	19	11	19	0	2	3	76	2	8	82
1911	17	32	13	42	1	13	12	1	8	85
1912	19	5	15	20	1	8	45	1	5	86
1913	8	35	9	7	0	16	85	0	16	93
1914	16	47	16	10	1	4	76	1	3	104
1915	22	56	22	38	2	2	12	1	18	66
Mean	20	55	20	36	1	17	78	1	15	105
Mean—Hay equivalent	—		—		2	5	109	2	3	93

TABLE XXVI.—*Showing Results from Wheat Dressed with ½cwt. of Nitrate of Soda and 2cwts .of Superphosphate, Comparatively with Wheat Dressed with 2cwts. of Superphosphate alone*, 1912-15.

Years.	GRAIN YIELDS.		TOTAL PRODUCE YIELDS	
	2cwts. Superphosphate. Bush. lbs.	2cwts. Superphosphate and ½cwt. of Nitrate of Soda. Bush. lbs.	2cwts. Superphosphate. T. C. L.	2cwts. Superphosphate. and ½cwt. of Nitrate of Soda. T. C. L.
1912	19 5	21 58	1 8 45	1 12 93
1913	8 35	9 28	0 16 85	0 17 28
1914	16 47	15 44	1 4 76	1 1 20
1915	22 56	21 49	2 2 12	2 18 37
Means	16 51	17 15	1 7 110	1 12 44
Means—Hay equivalent	—	—	1 14 14	1 19 56

In calculating the net values of the above tables, nitrate of soda has been assumed to be worth 14s. per cwt. Owing to the brief period over which the trial with ½cwt. has extended, any comparison in which this dressing is included must be viewed as inconclusive; however, if we take cognizance only of the differences between the mean yields on the top-dressed plots and their respective check plots, we arrive at the following results:—

TABLE XXVII.—*Showing Differences between Various Plots receiving 2cwts. of Superphosphate Per Acre, plus Different Quantities of Nitrate of Soda and Adjacent Check Plots Receiving 2cwts. of Superphosphate alone.*

	2cwts. Superphosphate per Acre plus		
	½cwt. Nitrate of Soda.	½cwt. Nitrate of Soda.	1cwt. Nitrate of Soda.
Difference in grain yield	–0bush. 19lbs.	0bush. 24lbs.	2bush. 24lbs.
Value	–1/1	1/5	8/5
Net profit or loss	–4/7	–5/7	–5/7
Difference in hay yield	–2cwts 16lbs.	5cwts. 42lbs.	4cwts. 38lbs.
Value	–3/9	9/5	7/7
Net profit or loss	–7/3	2/5	–6/5

It is somewhat difficult to extract from these results any evidence in support of the use of nitrate of soda in this district for either grain or hay crops. We have reason to believe that light dressings on the

sandy soils have given payable results on crops that have been "hanging fire," but on our stiffer lands the only instance of a payable response within our knowledge is the 2s. 5d. per acre appearing in the above table to the credit of the half cwt. dressing, and this is largely discounted by the fact that it represents the average of only four crops.

2. The effect of increasing the amount of superphosphate can hardly be commented upon with advantage at present, as the plots were started in 1912. The results are recorded below, and it will be noticed in passing that, up to the present, the additional superphosphate has had very little effect on grain production, but appears to have improved the hay yield.

TABLE XXVIII.—*Showing Results from Wheat Dressed with 3cwts. Superphosphate and 1cwt. of Nitrate of Soda, Comparatively with Wheat Dressed with 2cwts. of Superphosphate alone,* 1912-15.

Years.	GRAIN YIELDS. 2cwts. Superphosphate.	GRAIN YIELDS. 2cwts. Superphosphate and 1cwt. of Nitrate of Soda.	TOTAL PRODUCE YIELDS. 2cwts. Superphosphate.	TOTAL PRODUCE YIELDS. 2cwts. Superphosphate and 1cwt. of Nitrate of Soda.
	Bush. lbs.	Bush. lbs.	T. C. L.	T. C. L.
1912	19 5	25 14	1 8 45	1 17 41
1913	8 35	8 39	0 16 85	0 17 81
1914	16 47	16 32	1 4 76	1 5 53
1915	22 56	25 9	2 2 12	2 15 95
Means	16 51	18 53	1 7 110	1 14 11
Means—Hay equivalent	—	—	1 14 14	2 1 65
Difference	—	2 2	—	0 7 51
Ratio	—	7/1	—	13/1
Profit or loss	—	-11/5	—	-5/5

3. The season at which nitrate of soda should be applied.—Being a very soluble manure, nitrate of soda is easily washed out of reach of the roots if applied before the plants have taken firm hold of the soil. In humid climates the winter rains cause such serious leakage of nitrate nitrogen that nitrate of soda is almost invariably held back till the spring, and then broadcasted over the growing crop. Although the total rainfall here is relatively small, as a general rule most of it falls during the winter and the possibility of it being sufficiently heavy to wash out nitrates applied at seeding time led to the inclusion of a plot in which the nitrate of soda is not applied till the first week in August. This test has been carried out with 1cwt. dressings of nitrate of soda

in combination with 2cwt. of superphosphate per acre. The result obtained are as under:—

TABLE XXIX.—*Showing Returns Obtained from Plots Dressed with 2cwt. of Superphosphate and 1cwt. of Nitrate of Soda at Seeding, Comparatively with those Obtained on Plots Dressed with 2cwts. of Superphosphate and 1cwt. of Nitrate of Soda in Spring.*

Years.	GRAIN YIELDS.		TOTAL PRODUCE YIELDS.	
	2cwts. Superphosphate and 1cwt. of Nitrate of Soda at Seeding.	2cwts. Superphosphate and 1cwt. of Nitrate of Soda in Spring.	2cwts. Superphosphate and 1cwt. of Nitrate of Soda at Seeding.	2cwts. Superphosphate and 1cwt. of Nitrate of Soda in Spring.
	Bush. lbs.	Bush. lbs.	T. C. L.	T. C. L.
1905	36 1	34 26	3 4 107	2 19 62
1906	22 37	23 32	2 3 44	2 5 14
1907	20 29	19 31	1 8 95	1 5 51
1908	33 26	32 34	2 15 8	2 16 67
1909	34 45	36 46	3 2 61	3 6 95
1910	25 48	23 24	2 16 22	2 12 62
1911	21 10	22 11	1 16 62	1 17 81
1912	20 14	20 47	1 10 76	1 12 37
1913	6 14	5 27	0 12 37	0 12 3
1914	6 24	6 2	0 6 88	0 8 26
1915	29 25	28 40	2 11 64	2 10 79
Means.....	23 18	23 2	2 0 91	2 0 76
Mean—Hay equivalent..	—	—	2 9 86	2 9 68
Differences.....	0 16	—	0 0 18	—
Value	11d.	—	3d.	—

It would be possible, of course, to continue this trial for another decade, or even longer, if by doing so any useful purpose might be served It may be fairly claimed, however, that the original object in view has now been achieved, for we find that after 10 years the difference between the returns from the two practices compared are negligible and consequently it may be regarded as being immaterial which period is selected for the broadcasting of the manure. The convenience of completing the seeding operations at one time will probably determine the season at which it will be applied.

(*b*) SULPHATE OF AMMONIA.

Sulphate of ammonia is not so readily soluble as nitrate of soda, and the soil is better able to fix it, as very little leaching occurs until reaction with the soil carbonates and the conversion of the ammonia into nitrate nitrogen have taken place. Obviously, then, sulphate of ammonia requires to be autumn or winter sown, for if application be deferred to the spring there would be a grave danger of these chemical changes being too gradual under our climatic conditions to permit of the liberation of the nitrogen in an available state in time to be of service to the crop.

The general effects of sulphate of ammonia are akin to those produced by nitrate of soda, although the latter acts much more rapidly, and, under dry conditions, much more certainly. As already pointed out, however, the growing period of our crops is not usually marked by deficient rainfall, but the latter end of the spring is apt to partake of the character of summer, and it is the abrupt change that militates against the success of growth stimulants like sulphate of ammonia and nitrate of soda. The danger is that crops dressed with these fertilisers may make more vegetative growth than the reserves of soil moisture can adequately supply during the later stages of development, and consequently such manures do not generally have favorable opportunity of producing their full effects on the crops throughout the whole period of development. It was with the idea of learning to what extent a less active form of nitrogen would overcome this disability that sulphate of ammonia plots were instituted in 1911. The results obtained are given below:—

TABLE XXX.—*Showing Results from Wheat Dressed with 2cwts. Superphosphate and ½cwt. of Sulphate of Ammonia; and also Wheat Dressed with 2cwts. Superphosphate and ½cwt. Nitrate of Soda, Comparatively with Wheat Dressed with 2cwts. Superphosphate alone*, 1911-15.

	GRAIN YIELDS.			TOTAL PRODUCE YIELDS.		
Years.	2cwts. Superphosphate.	2cwts. Superphosphate and ½cwt. of Nitrate of Soda.	2cwts. Superphosphate and ½cwt. of Sulphate of Ammonia.	2cwts. Superphosphate.	2cwts. Superphosphate and ½cwt. of Nitrate of Soda.	2cwts. Superphosphate and ½cwt. of Sulphate of Ammonia.
	Bush. lbs.	Bush. lbs.	Bush. lbs.	T. C. L.	T. C. L.	T. C. L.
1911	17 32	—	17 50	1 13 12	—	1 14 9
1912	19 5	21 58	27 17	1 8 45	1 12 93	2 0 99
1913	8 35	9 28	6 7	0 16 85	0 17 28	0 12 23
1914	16 47	15 44	12 58	1 4 76	1 1 20	0 18 67
1915	22 56	21 49	26 45	2 2 12	2 18 37	2 10 85
Means.....	16 59	17 15	18 11	1 9 1	1 12 44	1 11 34
Mean—Hay equivalent ...	—	—	—	1 15 42	1 19 56	1 18 20

TABLE XXXI.—*Yields Compared.*

	GRAIN YIELDS. INCREASE OVER OR DECREASE BELOW,					
	2cwts. Superphosphate.			2cwts. Superphosphate and ½cwt. Nitrate of Soda.		
Manure.	Difference in Yield.	Gross Value.	Net Value.	Difference in Yield.	Gross Value.	Net Value.
	Bsh. lbs.	s. d.	s. d.	Bsh. lbs.	s. d.	s. d.
2cwts. superphosphate and ½cwt. nitrate of soda	0 24	1 5	-5 7	—	—	—
2cwts. superphosphate and ½cwt. sulphate of ammonia	1 12	4 2	2 10	1 2	3 7	3 7

TABLE XXXI.—*Yields Compared*—continued.

HAY YIELDS.

INCREASE OVER OR DECREASE BELOW.

Manure.	2cwts. Superphosphate.			2cwts. Superphosphate and ½cwt. Nitrate of Soda.		
	Difference in Yield.	Gross Value.	Net Value.	Difference in Yield.	Gross Value.	Net Value.
	c. l.	*s. d.*	*s. d.*	c. l.	*s. d.*	*s. d.*
2cwts. superphosphate and ½cwt. nitrate of soda	5 42	9 5	2 5	—	—	—
2cwts. superphosphate and ½cwt. sulphate of ammonia	2 90	4 11	−2 1	−2 20	−3 10	−3 10

These tables enable us to see that up to the present sulphate of ammonia has not made good as a wheat fertiliser in this district. On grain crops its use has given an increased return of 1bush. 12lbs., but after allowing for the cost of the manure at the rate of £14 per ton, the net result is a loss of 2s. 10d. per acre, as compared with the check plot. Similarly the hay yield was increased, but at a cost of 2s. 1d. per acre.

If we consult the figures given in the latter of these two tables, we will be able to compare sulphate of ammonia with nitrate of soda. It is true that the mean results cover a relatively short period, but nevertheless it is interesting to learn that in the case of grain crops the slower-acting form of nitrogen is slightly the better, whereas for hay crops the nitrate nitrogen has the advantage.

In concluding our remarks on the role of nitrogenous manures on clay loams, we would say that, so far as our observations have gone, there is no sound reason for believing that they may be profitably employed on wheat crops grown for hay or grain in this district.

3. POTASSIC MANURES.

Except in some of the light mallee districts, where enterprising settlers have occasionally tested potassic manures in a rough and ready manner, and thereby had their fixed ideas as to the inutility of potash as a fertiliser for cereals in South Australia rudely shaken, there exists in the minds of most farmers a firmly rooted conviction that potash in any form is "bad buying" for wheatgrowers under local conditions. In so far as this belief applies to our northern wheat areas, it appears to be well founded, although the results now being obtained from our Permanent Test Plots are not consistent with the view that potassic fertilisers are without effect on the wheat yield. The series of plots bearing on this question were initiated in 1911, so that the mean figures represent the average returns for five successive seasons.

TABLE XXXII.—*Showing Results from Wheat Treated with Potassic Manures, Comparatively with the Means of Two Adjoining Superphosphate Plots and of Two No Manure Plots*, 1911-15.

Years.	Means of Two No-Manure Plots.	Means of Two 2cwt. Super-phosphate Plots.	½cwt. Sulphate of Potash.	2cwts. Super-phosphate and ½cwt. Sulphate of Potash.	2cwts. Super-phosphate and ½cwt. Murinte of Potash.
	GRAIN YIELDS.				
	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.
1911	9 0	14 38	18 24	23 22	22 17
1912	10 43	19 50	17 32	23 49	25 6
1913	2 39	7 32	4 25	6 52	6 0
1914	6 17	11 34	5 3	7 53	11 52
1915	21 35	25 49	27 32	28 48	28 3
Means	10 3	15 53	14 35	18 9	18 40
	TOTAL PRODUCE YIELDS.				
	T. C. L.	T. C. L.	T. C. L.	T. C. L.	T. C. L.
1911	1 0 34	1 9 29	1 11 28	1 17 104	1 19 2
1912	0 17 63	1 9 64	1 7 8	1 14 73	1 17 15
1913	0 7 79	0 14 90	0 10 45	0 11 94	0 12 63
1914	0 10 75	0 16 69	0 7 1	0 9 80	0 14 86
1915	1 18 68	2 4 71	2 9 38	2 8 45	2 11 14
Means	0 18 109	1 6 109	1 5 6	1 8 57	1 10 103
Means hay equivalent ..	1 3 15	1 12 100	1 10 62	1 14 86	1 17 79

TABLE XXXIII.—*Grain Yields Compared.*

Manure.	Mean Yield.	INCREASE OVER OR DECREASE BELOW. No Manure. Diffce. in Yield.	Gross Value.	Net Value.	2cwts. Superphosphate. Diffce. in Yield.	Gross Value.	Net Value.
	Bsh. lbs.	Bsh. lbs.	s. d.	s. d.	Bsh. lbs.	s. d.	s. d.
anure	10 3	—	—	—	—	—	—
t superphosphate	15 53	5 50	20 5	11 5	—	—	—
t sulphate of potash	14 35	4 32	15 10	8 10	1 18	4 7	2 7
t superphosphate and ½cwt. phate of potash	18 9	8 6	28 4	12 4	2 16	7 11	0 11
t superphosphate and ½cwt. rate potash	18 40	8 37	30 2	14 2	2 47	9 9	2 9

Manure.	Mean Yield.	INCREASE OVER OR DECREASE BELOW. ½cwt. Sulphate of Potash. Diffce. in Yield.	Gross Value.	Net Value.	2cwts. Superphosphate and ½cwt. Sulphate of Potash. Diffce. in Yield.	Gross Value.	Net Value.
	Bsh. lbs.	Bsh. lbs.	s. d.	s. d.	Bsh. lbs.	s. d.	s. d.
anure	10 3	—	—	—	—	—	—
t superphosphate	15 53	—	—	—	—	—	—
t sulphate of potash	14 35	—	—	—	—	—	—
t superphosphate and ½cwt. phate of potash	18 9	3 34	12 6	3 6	—	—	—
t superphosphate and ½cwt. rate potash	18 40	4 5	14 3	5 3	0 31	1 10	1 10

TABLE XXXIV.—*Hay Equivalents Compared.*

Manure.	Mean Yield.	INCREASE OVER OR DECREASE BELOW. No Manure. Diffce. in Yield.	Gross Value.	Net Value.	2cwts. Superphosphate and ½cwt. Sulphate of Potash. Diffce. in Yield.	Gross Value.	Net Value.
	T. C. L.	C. L.	*s. d.*	*s. d.*	C. L.	*s. d.*	*s. d.*
No manure	1 3 15	—	—	—	—	—	—
2cwts. superphosphate	1 12 100	9 85	17 1	8 1	—	—	—
½cwt. sulphate potash	1 10 62	7 47	13 0	6 0	2 38	−4 1	−2 1
2cwts. superphosphate and ½cwt. sulphate potash	1 14 86	11 71	20 4	4 4	1 98	3 3	−3 9
2cwts. superphosphate and ½cwt. muriate of potash	1 17 79	14 64	25 6	9 6	4 91	8 5	1 5

Manure.	Mean Yield.	INCREASE OVER OR DECREASE BELOW. ½cwt. Sulphate of Potash. Diffce. in Yield.	Gross Value.	Net Value.	2cwts. Superphosphate and ½cwt. Sulphate of Potash. Diffce. in Yield.	Gross Value.	Net Value.
	T. C. L.	C. L.	*s. d.*	*s. d.*	C. L.	*s. d.*	*s. d.*
No manure	1 3 15	—	—	—	—	—	—
2cwts. superphosphate	1 12 100	—	—	—	—	—	—
½cwt. sulphate potash	1 10 62	—	—	—	—	—	—
2cwts. superphosphate and ½cwt. sulphate potash	1 14 86	4 24	7 4	−1 8	—	—	—
2cwts. superphosphate and ½cwt. muriate of potash	1 17 79	7 17	12 6	3 6	2 105	5 2	5 1

(*a*) SULPHATE OF POTASH.

In the first place, we would direct attention to the high returns derived from the plot receiving ½cwt. sulphate of potash in comparison with the mean yields of the two unmanured plots. The explanation is not far to seek. During the five-year period—1905-1909—the former was cropped with wheat four times, and on each occasion was dressed with 2cwts. of standard superphosphate and ½cwt. or 1cwt. of nitrate of soda per acre. This will no doubt influence the results for the first few seasons, but it is already evident that the effects are wearing off, as the mean difference is now 4bush. 32lbs., whereas in 1913 it was within a pound of 6bush. per acre. In total produce there is also a reduction, though the accumulated manurial residues appear to be more lasting in their effects on vegetative growth than on grain production.

We have next to contrast the figures for the ½cwt. of sulphate of potash plots with those given for wheat manured with 2cwt. of superphosphate in conjunction with a similar potassic dressing. In grain, the latter has yielded on the average an extra 3bush. 34lbs. per acre, which works out at 3s. 6d. per acre additional profit after allowing for the cost of the superphosphate. With regard to hay yields, however, the position is reversed, and it will be noticed that in Table XXXIV. there is shown a balance of 1s. 8d. per acre to the credit of

the plot receiving potash alone. This reversal of the order is contrary to the usual experience, and we can only surmise that the manure applied prior to 1911 is still influencing plant growth in a measurable degree.

If this were not so, we should be forced to admit that the mean yields from these two plots indicate that sulphate of potash alone is at least as serviceable as superphosphate plus sulphate of potash as a manure for hay crops under our conditions. Yet we see that both in grain and total produce 2cwts. of superphosphate have given a net return of over 2s. an acre more than the ½cwt. of sulphate of potash.

(*b*) MURIATE OF POTASH.

Now let us consider the form in which potash may be applied to the best advantage. The two chief sources of potash on the market are the sulphate and the muriate, and little if anything is definitely known as to their relative manurial values. The "potash" plots in No. 4 have been arranged to throw light on this question, and it will be observed that in the foregoing tables the muriate has come out ahead of the sulphate to the extent of 31lbs. of grain or 2cwt. 105lbs. of hay per acre per annum. The net values of these differences are 1s. 10d. and 5s. 2d. respectively. In every one of the five years the hay return has been appreciably heavier from the muriate plot, and it therefore seems probable that, in the future, it will be found that potassic manuring is a profit-bearing practice in this district. It is in the form of a muriate dressing that potash will first make its appearance on the farms. We shall be in a better position to discuss these comparisons when the experiments have extended over a longer period, and in the meantime we consider that no useful purpose would be served by basing conclusions on the available data.

4. FARMYARD MANURE.

This is the only complete fertiliser that has been subjected to trial at the College. It is very variable in composition and relatively poor in the elements of fertility. Roughly speaking, it contains equal amounts of nitrogen and potash, whilst the phosphoric acid present is approximately 50 per cent. less. First-class farmyard manure, manufactured under favorable conditions and good management, will contain up to 15lbs. of nitrogen, 15lbs. of potash, and 9lbs. of phosphoric acid per ton; but where the manure is derived from stock fed on a less sumptuous scale, and when the manure stack is exposed to the hot dry summers of this locality, the composition will doubtless fall much below these figures. We should probably err on the safe side if we assumed the manure with which we have to work in these experiments to contain 10lbs. each of nitrogen and potash and 5lbs. of phosphoric acid in a ton. Calculating on these figures, the total amounts of these

elements of fertility applied to the land in a 14-ton per acre dressing work out to be 1¼cwt. each of nitrogen and potash and 70lbs. or ⅝ (five-eighths) of a cwt. of phosphoric acid.

Thus we see that whilst farmyard manure is in itself relatively poor in plant food, yet by reason of the large quantities applied it becomes a carrier of unusually large amounts of the chief elements of fertility. Thus in a 2cwt. dressing of superphosphate we bring to the soil from 40lbs. to 50lbs. of phosphoric acid, whereas 14 tons of farmyard manure contain at least 70lbs. of the same ingredient. Similarly, 1cwt. of nitrate of soda conveys 16lbs. to 17lbs. of nitrogen to the land, and 14 tons of dung 140lbs.; again, 1cwt. of sulphate of potash contains approximately 56lbs. of potash, as against 170lbs. at a low estimate in farmyard manure. It should be stated, however, that the fertilising ingredients of farmyard manure are in a high state of dilution, and many complex changes must take place before the food elements incorporated in it can be released in a suitable condition for assimilation by growing plants. It is rather as a soil-restorer than a plant stimulant that we must regard this bulky manure. Additionally, we have to consider the mechanical effects of the fibrous organic matter which constitutes its mass. The typical wheat soils at Roseworthy are sticky and heavy to work, a condition that points to the need for replenishing the stores of humus in the land, and we may expect to find ultimately that the ameliorating influence of farmyard manure on the physical texture of our soils will influence in no small degree their fertility or "condition."

The arrangement of dunged plots included in the permanent experiments, together with the results obtained up to 1915, are appended.

TABLE XXXV.—*Showing Results from Wheat Dressed with 14 tons of Farmyard Manures, Comparatively with Wheat Dressed with 2cwts. Superphosphate and with Unmanured Wheat*, 1906-15.

Years.	GRAIN YIELDS.			TOTAL PRODUCE YIELDS		
	No Manure.	2cwts. Superphosphate.	14 Tons Farmyard Manure.	No Manure.	2cwts. Superphosphate.	14 Tons Farmyard Manure.
	Bush. lbs.	Bush. lbs.	Bush. lbs.	T. C. L.	T. C. L.	T. C. L.
1906	15 57	20 49	16 4	2 0 91	2 11 60	1 19 50
1907	13 21	14 58	14 31	0 18 17	0 19 13	1 1 6
1908	24 33	38 20	23 17	2 0 96	3 1 111	2 0 80
1909	26 2	31 2	33 23	2 6 97	2 15 66	2 16 85
1910	18 29	19 11	24 2	1 18 9	2 3 76	2 10 83
1911	5 39	17 32	19 11	0 13 20	1 13 12	1 17 96
1912	9 25	19 5	16 11	0 17 83	1 8 45	1 6 32
1913	2 41	8 35	4 43	0 9 44	0 16 85	0 15 30
1914	8 39	16 47	10 50	0 14 46	1 4 76	0 16 83
1915	19 51	22 56	19 32	1 16 30	2 2 12	2 6 107
Means	14 28	20 55	18 10	1 7 64	1 17 56	1 15 29

TABLE XXXVI.—*Showing Comparative Results from Wheat Dressed with Farmyard Manure alone, with Farmyard and Artificial Manures, and with Superphosphate alone, 1912-15.*

GRAIN YIELDS.

Years.	2cwts. Superphosphate.	14 Tons Farmyard Manure.	14 Tons Farmyard Manure and 2cwts. Superphosphate.	14 Tons Farmyard Manure and 2cwts. Superphosphate and ½cwt. Sulphate of Potash.
	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.
1912	19 5	16 11	24 13	25 26
1913	8 35	4 43	8 19	10 9
1914	16 47	10 50	16 7	14 51
1915	22 56	19 32	24 0	22 0
Mean—Hay equivalent..	16 51	12 49	18 10	18 6

TOTAL PRODUCE YIELDS.

Years.	2cwts. Superphosphate.	14 Tons Farmyard Manure.	14 Tons Farmyard Manure and 2cwts. Superphosphate.	14 Tons Farmyard Manure and 2cwts. Superphosphate and ½cwt. Sulphate of Potash.
	T. C. L.	T. C. L.	T. C. L.	T. C. L.
1912	1 8 45	1 6 32	1 18 16	1 19 98
1913	0 16 85	0 15 30	0 18 83	0 19 1
1914	1 4 76	0 16 83	1 2 5	1 1 105
1915	2 2 12	2 6 107	2 18 36	2 12 46
Means	1 7 110	1 6 35	1 14 35	1 13 34
Mean—Hay equivalent	1 14 14	1 12 10	2 1 95	2 0 69

TABLE XXXVII.—*Showing Comparative Values.*

GRAIN YIELDS.

Manure.	2cwts. Superphosphate per Acre.			14 Tons Farmyard Manure per Acre.			2cwts. Superphosphate and 14 Tons Farmyard Manure per Acre.		
	Diffce. in Yield.	Gross Value.	Net Value.	Diffce. in Yield.	Gross Value.	Net Value.	Diffce. in Yield.	Gross Value.	Net Value.
	B. L.	*s. d.*	£ *s. d.*	B. L.	*s. d.*	*s. d.*	B. L.	*s. d.*	*s. d.*
farmyard manure re	–4 2	–14 1	–3 15 1	—	—	—	—	—	—
farmyard manure 2cwts. superphos- per acre	1 19	4 7	–3 5 5	5 21	18 9	9 9	—	—	—
farmyard manure, superphosphate, ½cwt. sulphate of sh per acre.....	1 15	4 4	–3 12 8	5 17	18 6	2 6	–0 4	–0 3	–7 3

HAY YIELDS.

	C. L.	*s. d.*	£ *s. d.*	C. L.	*s. d.*	*s. d.*	C. L.	*s. d.*	*s. d.*
s farmyard manure cre	–2 4	–3 7	–3 4 7	—	—	—	—	—	—
s farmyard manure 2cwts. superphos- s per acre	7 81	13 6	–2 16 6	9 85	17 1	8 1	—	—	—
s farmyard manure, s superphosphate, ½cwt. sulphate of sh per acre.....	0 55	11 4	–3 5 8	8 59	14 11	–1 1	–1 26	–2 2	–9 2

It is apparent from these results that farmyard manure, even when worked into the land at the rate of 14 tons per acre is not equivalent in effect to 2cwts. of superphosphate for either hay or grain. In association with 2cwts. of superphosphate, however, this heavy application of dung increased the grain yield by 1bush. 19lbs., and raised the hay returns by 7cwts. 81lbs. per acre. The addition of ½cwt. of potash to this combination of manures did not produce any measurable effects.

In attempting to draw comparisons on a cash basis, we are confronted with the difficulty of valuing farmyard manure. Local market values for artificial fertilisers have been accepted for these tables, but as farmyard manure is a home-made product, which is not usually offered for sale in farming districts, it is not an easy matter to assess its value. Moreover, it is a commodity that varies considerably in value, according to its character and the care with which it has been stored. If we were to apply the unit system to the assumed composition, we should arrive at a value of from 8s. to 10s. per ton, which is a little above the current value of the best-quality dung in England. Under South Australian conditions, however, this would be an unduly high rate at which to charge up the manure, and we have, therefore, estimated it at 5s. per ton in the stack for the purposes of this report. It should not be forgotten, however, that an additional 1s. 6d. or 2s. per ton should, strictly speaking, be debited against the farmyard manure to cover haulage and distribution. Exclusive of cartage charges, however, the farmyard manure plots are handicapped to the extent of 70s. per acre for manure, as against a maximum of 16s. in the case of the plots with which it is necessary to compare them. The effect of this heavy debit is to convert all the credit gross values into exceedingly large net losses. Thus the gross value of hay increases, amounting to 13s. 6d. and 11s. 4d., have been changed to net losses of £2 16s. 6d. and £3 5s. 8d. respectively. There would appear, therefore, to be no valid reason for using farmyard manure on wheat crops on the expectation of receiving compensating increases in hay or grain yields.

There is one aspect of this matter, however, which has not yet been treated of experimentally, namely, the cumulative effects of organic matter on the water absorbing and retaining powers of the soil. At present, we have insufficient data to offer any remarks on this question, but in subsequent reports we may be in a position to do so.

For those who have a supply of farmyard manure, the best practice would be to place it under rank-growing crops, such as kale and rape, or else to use it as a top-dressing for lucerne pastures. If, however,

circumstances compel a farmer to apply it to a wheat crop, he would do well to note that in our experience the use of even 14 tons of dung per acre has not obviated the necessity of applying the usual dressing of superphosphate. The combination of farmyard manure and superphosphate, however, has given increased yields over and above the plots receiving only dung, which, at normal values, are worth 18s. 9d. per acre with grain crops, and 17s. 1d. per acre with hay crops.

5. LIME.

In many parts of South Australia lime is destined to play a very important role in conditioning the land for higher crop production. This will be the case in districts of heavy rainfall, even in localities where limestone is seen outcropping on the surface. In the Roseworthy district the soils mostly rest on a substratum of travertine limestone, and it cannot be said that there is any indication of lime deficency shown either by the crops or the spontaneous herbage of the pastures. The soil and climatic conditions do not encourage the belief that liming would be an economic practice, or that it would even lead to increased returns. Nevertheless, it is contrary to the tone spirit of experimental science to accept untested and unproven conceptions, be they ever so widespread. For this reason two plots in No. 4 Field were set apart to test the efficiency of lime as a soil dressing in the bare fallow-wheat rotation. Quicklime is purchased in the shell, ground to powder in our own mill, and applied at the rate of 5cwt. per acre, through the ordinary fertiliser drill, a fortnight or more before seeding. The following results were obtained during the last four seasons:—

TABLE XXXVIII.—*Showing Results from Wheat Treated with Lime and Superphosphate, Comparatively with those from Wheat Treated with Superphosphate alone*, 1912-15.

Years.	GRAIN YIELDS.		TOTAL PRODUCE YIELDS.	
	2cwts. Superphosphate.	2cwts. Superphosphate and 5cwts. of Lime.	2cwts. Superphosphate.	2cwts. Superphosphate and 5cwts. of Lime.
	Bush. lbs.	Bush. lbs.	T. C. L.	T. C. L.
1912	19 5	26 3	1 8 45	1 17 30
1913	8 35	10 6	0 16 85	0 18 99
1914	16 47	12 5	1 4 76	1 0 33
1915	22 56	20 33	2 2 12	2 8 76
Means	16 51	17 23	1 7 110	1 11 31
Mean—Hay equivalent	—	—	1 14 14	1 18 16
Difference	—	0 32	—	0 4 2
Value	—	1s. 10d.	—	7s. 0d.
Net value	—	-6s. 11d.	—	-1s. 9d.

It is clear from the above figures that up to the present the dosing of our soils with lime does not appear to be a paying proposition. It will be noted that in 1912 and 1913 the results were markedly in favor of the limed plots, whereas with the exception of the total produce returns in 1915, the yields during the last two seasons have been higher on the unlimed plot. The drought of 1914 would not tend to assist the crop on the limed soil, and, moreover, it should be pointed out that the check plot receiving superphosphate only has been in receipt of 2cwt. per acre every alternate year since 1905, whereas the limed plot was only brought in under a regular system of manuring as late as 1912. The value of the comparison in yields obtained in 1915 is vitiated in some measure by the disastrous effects of red rust. The disease appeared particularly rife in the crops growing at the western extremity of Field No. 4, and the limed plot suffered much more severely than did the check plot cited in the above table. Turning to the mean figures for the period 1912-1915, there is found to be an average increase of 32lbs. of grain or 4cwt. 2lbs. of hay as the result of liming; but when due allowance—1s. 9d. per cwt.—is made for the extra expense entailed, the practice is found to result in a net loss of 6s. 11d. per acre with grain crops, and 1s. 9d. per acre with hay crops.

In connection with lime, however, it must be realised that the cumulative effects will be seen in the amelioration of the soil, leading to easier and less costly tillage, and it remains to be seen whether in the course of time the benefits accruing from the use of calcareous dressings will not show up to greater advantage than they have done hitherto. At the present stage of the investigation, it would be misleading to frame definite conclusions on the virtues of lime as a soil amendment in this district.

SUMMARY OF MANURIAL EXPERIMENTS.

It will have been noticed that the foregoing manurial experiments do not all extend over the same series of seasons. At the present stage it is not possible to reduce them all to the same basis in this respect without sacrificing some of the most valuable data; but in the final table appended the plots have been grouped into three series, namely, the 1906-1915, 1910-1915, and 1912-1915 experiments, and the net cash values of the mean returns have been given for grain or calculated hay yields.

TABLE XXXIX.—*Summarising Direct Effects of Various Fertilisers on Wheat, as Indicated by Net Values of Mean Yields of Grain or Hay after Deducting Cost of Manure.*

(*a*) BARE FALLOW—WHEAT ROTATION.

Period.	Manure.	NET VALUE OF MEAN YIELDS. Grain. £ s. d.	Hay. £ s. d.
1906-15.	No manure	2 12 6	2 17 5
	½cwt. superphosphate	3 3 4	3 9 1
	2cwts. superphosphate	3 2 3	3 8 2
	2cwts. basic slag	2 14 1	3 2 2
	3cwts. basic slag	2 15 7	2 18 9
	2cwts. superphosphate and 1cwt. nitrate of soda (spring sown)	2 13 7	2 4 10
	2cwts. superphosphate and 1cwt. nitrate of soda (autumn sown)	2 14 1	2 4 2
	2cwts. superphosphate and ½cwt. nitrate soda	2 19 7	3 4 2
1912-15	2cwts. superphosphate	2 7 8	2 16 4
	2cwts. superphosphate and ½cwt. nitrate of soda	2 4 4.	2 13 1
	3cwts. superphosphate and 1cwt. nitrate of soda	1 18 7	2 5 3
	2cwts. superphosphate and ½cwt. sulphate of ammonia	2 8 0	2 9 4
	½cwt. sulphate of potash	2 0 9	2 3 1
	2cwts. superphosphate and ½cwt. sulphate of potash	2 2 11	1 19 10
	2cwts. superphosphate and ½cwt. muriate of potash	2 6 1	2 5 8
	5cwts. lime and 2cwts. of superphosphate	2 3 1	2 9 0
	14 tons. farmyard manure	1 5 2 – Loss	0 13 10 – Loss
	2cwts. superphosphate and 14 tons farmyard manure	0 15 5 – Loss	0 5 9 – Loss
	2cwts. superphosphate, 14 tons farmyard manure, and ½cwt. sulphate of potash	1 2 8 – Loss	0 14 11 – Loss

(*b*) BARE FALLOW—WHEAT—PASTURE ROTATION.

Period.	Manure.	NET VALUE OF MEAN YIELDS. Grain. £ s. d.	Hay. £ s. d.
1910-15	No manure	1 6 11	1 12 11
	½cwt. superphosphate	2 6 1	2 7 5
	1cwt. superphosphate	2 5 11	2 14 8
	2cwts. superphosphate	2 0 10	2 10 11
	3cwts. superphosphate	1 16 0	2 6 10

(*To be continued.*)

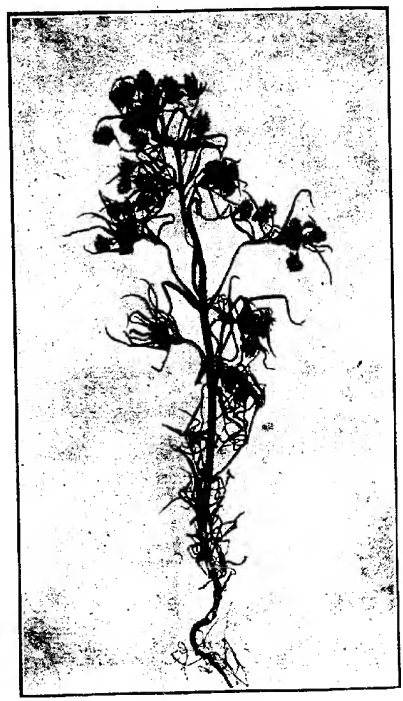
MANURIAL VALUE OF BONES.

As to the relative manurial values of crushed bones and burned bones, the Director of Agriculture says much depends on the extent to which the bones are burnt; if merely charred, beyond the destruction of a little organic matter there will be little difference. If the bones are roasted to the extent of supplying on grinding what is known as animal charcoal all the organic matter will have been destroyed, but the tricalcium phosphate will be appreciably more soluble.

"THE FLEA-SEED."—A NEW WEED PLANT.

[By Professor T. G. B. Osborn, M.Sc.]

One of the most recent additions to the alien weed flora of this State is *Plantago Psyllium L.* This plant was sent to the Department of Agriculture for identification by the Agricultural Bureau of Nantawarra at the end of October, together with the information that it



was spreading rapidly in the district. Since it is likely that the plant will continue to spread, particularly in sandy districts, unless precautionary measures are taken, a short description is here given, so that farmers may be on the watch for its first appearance, and check it before it becomes a serious nuisance.

The specimens of *Plantago Psyllium* submitted to the department are tough herbaceous plants 6in. to 8in. in height. They have usually a single upright stem bearing opposite pairs of narrow pointed leaves. In connection with each leaf there is usually found, particularly at the upper end, a side shoot which may branch again, so that the growth is rather bushy. The whole plant is somewhat sticky with glandular hairs. The flowers are produced in little spherical to egg-shaped clusters, ¼in. to ½in. long, at the ends of slender stalks that may be fully an inch in length. Each flower cluster is really a short spike consisting of a dozen or so flowers. The individual flower is inconspicuous. The petals are joined into a tube, which ends in a four-pointed star; they are chaffy and of a pale-yellow color. The seeds are small, flattened, oval, brown bodies; fortunately they have no special method for ensuring rapid dispersal, for 800 to 1,000 seeds is a moderate computation for each plant.

Plantago Psyllium is a native of the Mediterranean coasts, spreading north into Austria and east as far as Persia. It is a member of the same family as the ribgrass (*Plantago lanceolata*), but is not at all like that plant in appearance. At a casual glance it rather resembles a plant of "stinkwort" (*Inula graviolens*). A careful look at the flowers, however, shows that there is no relationship whatever to the stinkwort family. The flowers are very similar to those of the ribgrass, in spite of the differing habits of the plants.

The specific name *Psyllium* comes from a Greek word meaning "a flea;" this idea is also expressed in the common German name *Flohsamen* ("flea-seed"). Presumably the brown seeds have some fancied resemblance to that insect. Unlike many of our alien plants, the flea-seed is not without some commercial value. The seeds are rich in a mucilage, and when soaked in water give a gummy extract. This gum is used in parts of Europe and the Orient for imparting a "finish" to textiles and for stiffening muslin. The seeds are also used medicinally; they occur in the Pharmacopœia as *semen psyllii*, and their gummy extract is used as a soothing lotion in cases of inflammatory ophthalmia. Baron von Mueller, in his "Select Extra-Tropical Plants," suggested that the flea-seed is suitable for naturalisation along sandy coast lands, but I am not aware that any attempt has been made to do so in Australia. In fact, the record of this plant by the Nantawarra Agricultural Bureau is the first notice of its occurrence in Australia. The trouble with such a plant is that it is exceedingly unlikely to confine its attention to waste coast lands, but will probably spread over much of our light sandy country, to the detriment of useful fodder plants. At present it appears to be most abundant on a four-acre patch some 16 miles from Port Wakefield, on the Lochiel main road. There are, however, other small areas affected in the district. How it can have got there is not easy to see. Probably it was introduced into the State in ballast, and may have spread up from the coast.

In spite of the fact that in certain parts of the world the seeds have some commercial value, I am informed by the managing director of

one of the largest drug houses that it is very unlikely that any use could be made of them in Australia. Since the plant appears to be at the height of its growth in October, it is merely cumbering the ground, choking out valuable plants and robbing the soil. It is, therefore strongly recommended that the plant be destroyed wherever found. Since it is an annual, this should be fairly easy if it be taken in time. Any methods of cultivation that will prevent seeding should be effective, and all farmers who have the interest of their land at heart are urged to do their best to stamp out this most recent "undesirable immigrant."

PLEURO-PNEUMONIA AND TUBERCULOSIS.

A correspondent, writing from Wilcannia, seeks assistance in determining whether an animal is affected with pleuro-pneumonia or tuberculosis, (a) *ante mortem*, and (b) *post mortem*. In reply, the Government Veterinary Lecturer (Mr. Place) has set out the differences briefly, as follows:—

Ante Mortem Differences.

Pleuro.	*Tuberculosis.*
Onset more or less quick.	Onset slow.
Head poked and drooping, shallow, painful breathing.	Head carried straight out when glands are affected.
Death after a few days in acute cases.	Pining and slow death.
Slow recovery.	Steady progress from bad to worse, often slow.
Grunting when struck.	Cough when hurried.
Bowels more or less normal.	Acute diarrhœa in advanced cases.
Eyes sunken.	Eye often too bright.
Signs of fever, such as dry nose, fevered eye, salivation, and shoulders humped.	Gradual loss of flesh, swelling of glands of throat, stiffness.

Post Mortem Differences.

Pleuro.	*Tuberculosis.*
Lungs markedly inflamed, thickened, and "marbled," *i.e.*, tissue thick between lobules. Much straw-colored fluid in lungs and pockets of it in fibrous thickening between lungs and ribs and in chest; other organs not much disturbed.	All organs liable to attack. Tubercles varying in size from pin's head to potato in substance of lungs, on lining of chest and belly, breaking down into abscesses, or cheesy or gritty like gravel.
Glands not enlarged; lungs much enlarged.	Glands (kernels) nearly always much enlarged, lungs not so.
Dark, hard areas.	Tubercles not hard areas. Glands of bowels, liver, spleen, etc., often all involved.

POISON HEMLOCK.

(*CONIUM MACULATUM, L.*)

A DEADLY PLANT.

[By H. W. ANDREW, Botanical Assistant and Quarantine Officer for Plants, South Australia.]

This plant is a proclaimed weed pest under the Federal Quarantine Act, and plants or seeds of it are absolutely prohibited from entering the Commonwealth. It is also proclaimed noxious for the State of Victoria. Hitherto it has not been recorded as growing wild in this State, although the "Naturalised Flora of South Australia" states that Dr. R. S. Rogers found it growing wild in Neptune Island in January, 1907. Recently, at Kapunda, the writer found specimens growing in a number of vacant allotments in and around the township—evidently established as a garden escape—the plant being quite commonly grown in the gardens of the township. Some of these were vigorous specimens, over 5ft. in height, the showy umbels of flowers and pretty fern-like leaves making a rather handsome plant, which latter goes to explain its cultivation under the name of the Carrot or Parsley Fern. In Victoria, too, it is regarded as a common garden escape, although its seeds are occasionally found mixed with other commercial seeds as an impurity. Besides these plants at Kapunda the writer, while collecting weed seeds some time previously along the Torrens River, found patches of the weed along the northern bank near Morphett Street and Hackney Road bridges.

HEMLOCK AS A POISON PLANT.

Mr. J. H. Maiden, the Government Botanist of New South Wales, in "Some Observations of Weeds," published in the *Government Agricultural Gazette* of New South Wales, January, 1916, says, "Undoubtedly the Hemlock (*C. maculatum*) . . . . . is a deadly plant, dangerous alike to stock and human beings. Late research indicates that all parts of the plant are poisonous, because of the presence of a resin known as *Cicutoxin* . . . ." In a previous article the same authority states, "Most little English children have had to learn the lines addressed to the . . . . 'pretty cow' who is warned not to chew the Hemlock rank. An ingredient of the witches' cauldron in *Macbeth* is 'root of Hemlock, digged i' the dark.'

"As a small boy I have always been taught to look upon the Hemlock with horror, as a sort of vegetable tiger snake in fact, and in walking through a dampish meadow, through which a brook meandered, I have been pulled aside by my elders, and kept under supervision if there were any Hemlocks about. That cows nibble the Hemlock, and that it has dire effects on them, their milk, and their butter, is so ingrained in me, as one of my beliefs, that to depart from it now would be sheer heresy. I would, therefore, again warn owners of dairy cattle against it, Pierpont Johnson notwithstanding, for in later years I have looked into the evidence against Hemlock and find its dangerous properties not overstated.

Conium maculatum (Linn).
("Agricultural Gazette of N.S.W.")

"Pierpont Johnson begins an account of the plant—The Hemlock is such a dangerous plant that all living in the country should render themselves familiar with its appearance. From its very poisonous nature it is always a dangerous plant to have in fields and pastures, as sheep will often eat it. Horses and cows refuse to touch the herb.

"The Hemlock was probably the plant used to poison Socrates, and it is believed to have been the usual poison administered to those sentenced to death by the Areopagites, in the days of ancient Greece. Many cases of poisoning of human beings, both in England and the Continent of Europe, have been verified; in these cases it has been used as a pot-herb in mistake for some other plant. It must be remembered that the poisonous nature of Hemlock is beyond all dispute, unlike many of our so-called indigenous poison plants, further investigation of which, happily proves their evil reputation to be undeserved."

In "The Weeds, Poison Plants, and Naturalised Aliens of Victoria," published in 1909, Professor Ewart states, "It recently was responsible for the poisoning of a number of cows at Warrnambool, and also for the death of a child at Clunes. Fortunately its smell usually repels stock and children, but the plant is highly poisonous owing to the presence of the poisonous alkaloid (*coniin*), most abundant in the seeds, but also present in the leaves and stem. Goats appear to be largely immune to the action of the poison."

Description.

A smooth, more or less purple spotted biennial, 2-5ft. high, the leaves are bright green, large and compound, the segments being deeply cut as in most plants of the natural order *Umbelliferæ*, to which the carrot, parsnip, and parsley also belong. It grows on waste places near hedges, by roadsides and streams; stem hollow and smooth, and somewhat glaucous, with purplish dots. When bruised, the leaves emit a peculiarly repulsive mouse-like odor. The flowers are white or greenish white. The fruit is distinctive, being somewhat globular in shape, and each half is marked with five wavy ridges. It is found in temperate Europe and Asia, and naturalised in N.E. America, California, and Chile.

Eradication.

These plants are large and conspicuous, and "on waste ground are best pulled up, piled, and burnt, and the ground, if possible, kept covered with other vegetation to prevent its re-establishment by seedlings. On cultivated ground it gives no trouble, though apt to spread along hedges, the borders of fields, the banks of streams, &c. Here, cutting down is sufficient, and the seed in the soil being short-lived, are soon exhausted" (Professor Ewart).

As this plant is certainly not widely spread in South Australia, occurring in a wild state in small patches, and only within the Corporations of Adelaide and Kapunda—as far as can be ascertained—it seems desirable that steps should be taken immediately by responsible authorities to stamp it out before the "seeds" ripen, about December or January. Cows and horses were seen to be grazing in allotments at Kapunda where the weed was growing, and there is the possible danger of it being eaten when the grass dies off, leaving only the green Hemlock to tempt the stock. Along the Torrens River the same danger exists, and in a thickly populated place like Hackney

there is always the possibility of children eating the "seeds" of the Hemlock which roughly resemble those of Fennel (*Fœniculum vulgare*, Mill), which grows alongside it.

It might also be advisable to give publicity to the danger of growing this plant in home gardens.

Hemlock is not on the list of weeds proclaimed under the Noxious Weeds Destruction Act, South Australia.

SOIL IMPROVEMENT.

A correspondent, farming in the Pinnaroo district, has submitted a number of questions which are of particular interest to those who are working the sandy soils of a similar nature to those to be met with in the area referred to. "Would it improve the sandy soil to plough in a green crop in August, and roll it well with a heavy roller?" he inquires. "Secondly, would you advise early ploughing, say, March, and sowing the green crop before rain fell? Third, would you advise feeding off the manure crop, or allowing it to grow untouched? Fourthly, is there any danger of overloading the soil with green manure; and, finally, do you favor light dressings of farmyard manure, frequently applied, or a heavy dressing, say, every five years?"

To these the Superintendent of Experiments (Mr. W. J. Spafford) has replied as follows:—

1. A green crop ploughed in as manure in August and then heavily rolled will most certainly improve a sandy soil; indeed, this is how sandy soils the world over are reclaimed. The time of the year for ploughing in can hardly be fixed, other than being sure that it is done before the spring is too far advanced, as it depends very largely on the state of growth to be turned under; the plants should be still soft and sappy, so that they decompose readily when covered. The later in the year that this operation is carried out the heavier and more perfect should the rolling be, to get the best results.

2. The earlier the green manuring crop is sown the better, as it will then make good growth before the cold weather sets in, and can be ploughed under early in the year. The land should be stirred in February or March, and if an early autumn rain does not fall, the seed can be sown dry, so as to have the job finished before you are ready to commence ordinary seeding operations.

3. If the land is worked out, *i.e.*, of very low fertility, it would be much better to get the full growth of the crop ploughed in, instead of feeding it off with stock. If it is a matter of preventing the soil from becoming worked out, the green manuring crop can be fed off, and

the droppings will then be ploughed in with the second growth; the advantage of this method is that you get a direct return from the manuring crop through the stock. The best way to prevent sandy soils from being worked out, which happens quickly in our climate, is to crop them seldom and stock them heavily, being careful not to lose the droppings from the stock.

4. The only soils likely to get more green organic matter put into them than is good for any one year are very wet, cold soils and those exceptionally rich organic soils that have not yet been sweetened. In your district these conditions do not exist, and you cannot put too much green sappy organic matter into any of your sandy soils, providing the soil gets reasonable after treatment.

5. The best way to apply farmyard manure is in fairly heavy dressings, repeated every few years; but the cereals should never follow immediately after such dressings. This means that heavy dressings of farmyard manure should only be used when a rotation of crops is being carried out, and a bulky fodder crop, such as mangolds, kale, &c., follow the stable manure. For cereals only, the manure should be applied lightly and often.

ADVISORY BOARD OF AGRICULTURE.

The monthly meeting of the Advisory Board, which was attended by Messrs. F. Coleman, A. M. Dawkins, C. J. Tuckwell, J. Miller, G. Jeffrey, W. J. Colebatch, T. H. Williams, G. R. Laffer, M.P., and H. J. Finnis (Acting Secretary) was held on Wednesday, November 8th.

Officers.

Mr. F. Coleman was selected as Chairman for the current year, and Mr. G. Jeffrey was appointed Vice-Chairman.

Congress Resolutions.

Various resolutions which were passed by the 1916 Congress were dealt with. One resolution, urging the compulsory marking of cold-stored, imported, and pickled eggs, was referred to the Minister of Agriculture, with a statement to the effect that the Board did not indorse the recommendation. Others were referred to the Minister without comment.

Consideration was given to the proposal that Branches should be asked to express an opinion on the question of prohibiting the importation of eggs from Asiatic countries. The Board decided that this matter should not be submitted to the Branches.

Thirty-three names were added to the rolls of existing Branches.

ANALYSES OF FERTILISERS.

The following are the results of analyses (other than those published in August last), made by the Agricultural Analyst (Mr. C. E. Chapman), of samples of fertilisers taken by inspector and assistant inspectors under the Fertilisers Act since the beginning of the present year :—

Name of Firm and Fertiliser.	Phosphate.						Nitrogen.		Potash.	
	Water Soluble.		Citrate Soluble.		Acid Soluble.					
	Vendor's Guarantee	Result of Analysis.	Vendor's Guarantee	Result of Analysis.	Vendor's Guarantee	Result of Analysis.	Vendor's Guarantee	Result of Analysis.	Vendor's Guarantee.	Result of Analysis.
	%	%	%	%	%	%	%	%	%	%
Adelaide Chemical & Fertiliser Co., Ltd.—										
Potato manure No. 1 (from E. & W. Hackett's store, Adelaide)	20·00	17·5	10·0	9·9	5 0	5·6	1·5	1·7	4·5	4·6
Potato manure No. 1 (from Silbert, Sharp, & Bishop, Ltd., store, Adelaide)	20·00	28·7	10·0	8·5	5 0	4·5	1·5	1·6	*	—
Special Lawn Manure (from E. & W. Hackett's store, Adelaide)	7·0	11·8	7·0	7·0	8·0	4·2	6·0	6·7	—	—
Special Bone Manure (from Silbert, Sharp, and Bishop, Ltd., store, Adelaide)	—	—	—	—	17·5	24·0	2·4	3·1	—	—
Bone and super. (from S.A. Fruit and Vegetable Co., Adelaide)	23·0	18·0	7·0	13·5	10·0	6·6	1·4	2·2	—	—
Miller's Lime, Ltd.—									2·5	2·1
Miller's potash lime fertiliser	—	—	—	—	—	—	—	—		
Wallaroo-Mt. Lyell Fertilisers, Ltd.—										
Potato manure No. 1 (from Silbert, Sharp, and Bishop, Ltd., store, Adelaide)	20·0	19·9	10·0	8·2	5·0	6·3	1·5	1·7	4·5	4·6
Vine manure	20·0	22·2	10·0	8·5	5·0	4·5	1·5	1·48	4·5	4·28
Potato manure No. 2	30·0	34·9	4·0	1·3	4·0	3·5	1·20	1·1	4·2	3·37
Bone super	15·0	18·0	15·0	10·2	4·0	7·7	1·60	1·69	—	—
Grass manure	12·0	12·0	14·0	15·9	10·0	9·8	·50	·69	·50	·64
Metropolitan Abattoirs Board—										
Blood manure (from A. H. Hasell's store, Port Adelaide)	—	—	—	—	—	—	13·0	13·4	—	—
Bone manure No. 1	—	—	—	—	32·0	32·9	4·5	4·9	—	—
Bone manure No. 2	—	—	—	—	26·5	29·8	4·7	5·7	—	—

TILLAGE OF THE SOIL FOR WHEAT GROWING.

[An address delivered by the Superintendent of Experiments (Mr. W. J. SPAFFORD) before the Pinnaroo Branch of the Agricultural Bureau.]

South Australian farmers are rightly noted throughout Australia as good cultivators of the soil, and it is because of their expertness in handling soils that the other States of the Commonwealth are eager to secure them as settlers. The climatic conditions of most of the wheat-growing parts of this State have led to this condition of affairs, for in anything but the good seasons it has been found to be quite essential to give the soil much and good tillage if payable crops are to be secured. Many South Australian farmers are able to retire as comparatively young men and live in the city or larger towns, and I personally think that this is mainly due to the fact that they have cultivated their farms well. Further, I think the days of extraordinary improvements in our practice are past, such for instance as the introduction of the use of superphosphate, with its wonderful and enormous advancement in our crop production, and that other than the appearance of new machines or implements considerably cheapening the cost of production, whatever progress we make will be gradual, and a good deal of the improvement will have to do with the handling of our soils. We have certainly done much for a young country towards evolving a system of soil treatment suitable to our special conditions, but there is still much to do, and the sooner we understand the why and the wherefore of the different operations, the sooner will we become masters of the situation, and the sooner will the average yield of the cereals be increased throughout the State. That we have not yet realised to the full the advantages of cultivation, is easily seen by studying the work put into the land in the better farmed countries, where yields are high; not, of course, that the methods used in those places would suit our conditions, but they show what a large amount of expensive work these farmers are prepared to do, knowing well they are well repaid for all the work done. This point was brought home to me again only last week by a letter from one of our soldiers in France, who said "it would frighten you to see the work the farmers put into their land; they plough, roll, harrow, roll, cultivate, roll, harrow, roll, harrow, roll, harrow, roll, harrow, and if they have any time before seeding they

roll and harrow again. You see the benefit of this work, however, in the crops, most of which are thick and as level as billiard tables."

Need for Cultivation.

Soil cultivation is not necessary for the growth of plants, as we see in Nature the land covered with plants, but it is indispensable to the growth of some plants and absolutely essential to the good growth of most plants we know as "cultivated" plants. This is seen very often when the land has been left idle after having carried some cultivated crop: the cultivated plants very quickly disappear from the soil or else grow very weakly, and this is accounted for by the fact that the plants have been pampered so long that they have lost their original hardiness, and so cannot compete with plants not so treated.

The Objects of Cultivation.

Deepening the Soil.—When we set about growing crops we aim at getting as much off a given area as possible, and so we crowd more plants on to the land than would grow there naturally, and to compensate for the restricted surface soil space for the roots of each plant we deepen the soil. This deepening the soil allows the roots of plants to feed at greater depths than they can in unstirred land; not that plants in nature cannot send their roots to great depths, but in cultivated land they can do this with greater uniformity and certainty. Also the roots of plants need an unfailing supply of oxygen if they are to continue growing, and in land left uncultivated this supply is very limited below the immediate surface, and so most quick growing plants on such land must keep their roots near the surface to obtain their necessary quantity of oxygen. Cultivating the soil deepens it for plants, because it considerably increases the quantity of oxygen by exposing the soil to the air, as well as by admitting the roots to penetrate to greater depths with greater ease than if left untouched.

Water Requirements of Plants.

The growth of all plants depends very largely on the available supply of moisture; indeed, water must be constantly and uninterruptedly passing through the tissues of the plants from the roots to the leaves and then into the atmosphere, if the plant is to make growth. The quantity of water needed by plants is enormous; it has often been measured for different cultivated plants and ratios worked out between it and the dry matter formed. These ratios have varied very considerably for all types of crops, but if we take the average European figure for wheat, which very possibly will be the minimum with us, it will give an idea of how enormous is the amount of water

that passes through the wheat crop during its growth. The amount of water passing through wheat plants to produce 1lb. of dry matter is 300lbs., so with a 2-ton crop of wheaten hay retaining 10 per cent. of moisture, the water necessary to actually pass through the plants during its growth is a minimum of 1,209,600lbs., or 120,000galls., or 540 tons to the acre. Now all of this moisture must come from the soil, and cultivation is intimately connected with its storage and distribution. In the first place the loosening of the land prevents the rain that falls from running off the surface, and so it enters the soil. Also, as the spaces between the particles is much greater in cultivated than in uncultivated land, it holds much more water before it becomes saturated with it. But as the rain falls in showers with varying periods of time between them (in some cases up to months) plants are wholly dependent on the power of soils to hold this moisture, and on the movement of the water in the soil.

The Retention of Moisture by the Soil and the Movement of this Moisture.

When rain falls and enters the soil it gradually sinks under the attraction of the forces of gravity, but leaves a film of water surrounding all of the soil particles, and each of these films is in contact with its neighboring films. These films are held by the particles by what is known as "surface tension," or the attraction of surfaces of solids for liquids, and is the same power that makes the hairs of a brush cling together when wet, and that keeps the inside of a smooth vessel like a glass tumbler wet, although the liquid has been poured out and the glass kept upside down for some time. The water continues to sink through the soil, all the time thinning out the film surrounding the particles like stretching a rubber band, until the force of the attraction of the surfaces of the particles is great enough to equalise the pull of the forces of gravity, and then the moisture sinks no farther. When this stage is reached evaporation of moisture at the surface of the soil immediately upsets the equilibrium by thinning the film at the surface. The forces of gravity are overcome by this thinning of the film at the surface, as the greatest pull of the film is at the thinnest part, like it is on a stretched rubber band, and the moisture rises from the subsoil until a new equilibrium is reached. This process of evaporation at the surface and rise of subsoil moisture is quite continuous on unworked soil, once natural drainage has taken place.

This rise of subsoil moisture can, of course, only take place while the film is continuous and unbroken, so it is easy to see the part cultivation plays in controlling the loss of moisture from the soil. It is

not hard to realise that if the point at which evaporation of soil moisture is taking place is three inches below the surface, the amount of moisture drawn off will be very considerably less than if it is right at the surface of the soil. This is just what we do when we cultivate; we break the continuity of the particles to the depth that we work the land, with the result that the moisture only rises to the line where the implement stirred the soil. Of course evaporation takes place from there, but it is only a fraction of what it is where the soil is left firm and the film intact right to the surface. After the first heavy rain the continuity of the film is re-established, and so the need of a cultivation after rains. This is perhaps more easily explained by what happens with a brick and a sponge; if a sponge be filled with water and a dry brick hung so that it touches the wet sponge it will withdraw practically all of the water from the sponge, but if a brick be filled with water, a dry sponge will draw but little of the water from the brick. When we cultivate we make the surface of the soil like the sponge, and if we are trying to conserve moisture we never let the surface get like a brick, but always keep it like the sponge, loose and open.

Availability of Mineral Matter as Plant Food.

Mineral matter to be available to plants must be soluble in soil moisture, and so far as is known this is the only way in which plants can utilise mineral substances. Soils in the first place are formed by the action of natural agents on the solid rocks, and it is the continuing of these operations that so reduce the tiny fragments of rocks that parts of them become soluble in soil moisture and so available to plants. Cultivation helps very considerably in this work by exposing much of the soil to the weathering agents, and particularly by bringing up some of the more deeply seated soil particles that would otherwise never come under their influence.

Work of Useful Soil Bacteria.

Soil bacteria play a very important part in soil fertility, more particularly in the fixing of nitrogen into an available mineral form, one class collecting and storing nitrogen from the atmosphere and another splitting up organic matter into available substances. These bacteria are encouraged and their activities greatly increased by the cultivation of the soil, because the moisture content and the oxygen is increased. Further, these bacteria can only work actively within a limited range of temperature, and the soil is kept between the extremes for a much longer period when cultivated than when left untilled. Indeed, as the common essential requirements of life, including these bacteria, are moisture, warmth, and oxygen, well-worked

fallow land in our climate is almost ideal for their activities; the moisture is kept at such a depth that it does not readily get cold nor yet soon become hot, and every cultivation admits a plentiful supply of oxygen. This helps to explain why it is that up to the present nitrogenous manures have not proved profitable on good fallow land.

Destruction of Weeds.

The presence of weeds in a crop means that the crop has to struggle against hardier competitors for soil space, food, and moisture, and cultivation in some form or other is always resorted to in order to reduce to a minimum this battle for existence.

Seed Bed.

Practically all the cultivations given to the land lead in the end to formation of the seed bed, in which the crop germinates and makes its early growth. Most crops depend very largely for success on the condition of the seed bed into which they are sown, and so all cultivations should be so given as to tend towards the ideal seed bed for the crop to be grown. This dependence on the seed bed is very marked with the wheat crop in this State, particularly in the dry years.

The ideal seed bed for wheat is land free from weeds, that has been ploughed up and so worked down that only the immediate surface is loose, and the under layers well compacted together; and all tillage operations undertaken should do something towards the creating of such a seed bed.

Local Practice.

Now the practice of South Australian farmers is mainly that known as bare fallowing the land, which, briefly, consists of ploughing the land as soon after seeding operations are completed as is possible, and working it with various implements until the seeding season arrives. As was pointed out, all forms of cultivation lead in the end to the formation of an adequate seed bed, and this fact should never be lost sight of when a tillage operation is about to be undertaken. The ploughing breaks up the soil, giving it a very thorough aeration, admits the rains, and buries the organic matter which always collects on the surface. The subsequent cultivations keep the land free from the plant-food and moisture robbers—the weeds—and keep the surface of the soil free from a solid crust. Now when heavy rains fall after the land is ploughed no difficulties to the production of an ideal seed bed arise; the rains compact the underlayers, and the subsequent cultivations clean the land, and prevent the loss of the moisture by breaking the continuity of the film of moisture in the production of that loose mulch of earth at the immediate surface of the soil, which

is one of the essentials of the ideal seed bed. When heavy rains do not fall after ploughing, this seed bed is not so easily obtained, for the underlayers do not become compacted together, and so the operations must be varied, and a heavy roller is required to do the work usually done by the rains. When the ploughing is done late in the season, say after the middle of September, when there is only a small chance of heavy rain falling, this rolling to compact the underlayers should be considered as an essential operation. Of course in local practice it is usually recognised that as the ploughing season advances the depth to which the land is ripped up is reduced, so that anything ploughed after, say, the middle of September, which can be considered as late fallow, is usually only turned over to a depth of about half that at which the fallowing was commenced in July. This reducing the depth as the season advances, although in most cases the reason is not known, is done so as to get as near the ideal seed bed as possible; but that it is not necessary and certainly not as good as if the after treatment is correct, is clearly shown by the result obtained from the "cultivation" plots at Roseworthy Agricultural College.

Late Fallow Properly Cultivated.

Here, four plots are ploughed early, *i.e.*, in July, to a measured depth of 7in. and treated in various ways: plot 1 rolled within a few days of ploughing and cultivated afterwards whenever necessary; plot 2 harrowed within a few days of ploughing and then cultivated whenever necessary; plot 3 left throughout the winter and then cultivated three times during the season; plot 4 cross skim-ploughed and then cultivated whenever necessary. Two plots are ploughed late, *i.e.*, after September 1st plot 5 is ploughed 7in. and heavily rolled the same day as ploughed and cultivated or even rolled again if necessary—good tillage throughout; plot 6 is ploughed only 4in. deep, cultivated after rain and again when necessary, but not rolled.

For the four years 1912-1915 these plots have yielded on the average—

Plot 1	1 ton 10cwts. 54lbs. hay
" 2	1 ton 9cwts. 75lbs. "
" 3	1 ton 9cwts. 49lbs. "
" 4	1 ton 11cwts. 33lbs. "
" 5	1 ton 12cwts. 36lbs. "
" 6	1 ton 4cwts. 36lbs. "

These figures show the greatest return for plot 5, the late-fallow plot ploughed 7in. deep, and the lowest yield for plot 6, the late-fallow plot ploughed only 4in. deep but not rolled. Details of these cultivation plots are to be found in the sixth report on the Permanent Field Experiments of Roseworthy Agricultural College, appearing in the October issue of the *Journal of Agriculture*, 1916.

Depth of Ploughing.

It is almost unanimously declared by farmers of this State that shallow ploughing is the best that can be carried out under our conditions; and to make money quickly off the farms, mainly because the cost of production is reduced due to the operation of ploughing being less expensive, and the after cultivation necessary to prepare the ideal seed bed is diminished, this is so. This state of affairs can only last while our cultivated soils are new—all of them are still comparatively virgin—and it is only good for the individual, but is bad for the soils and so for the State. When the day comes that farmers as a whole work the farms for a living, with the intention of leaving them to their sons, instead, as is the case now, of making money quickly from them and then selling out, then will deeper ploughing be the rule rather than the exception. It is only reasonable to suppose that the turning over and stirring up of soils to greater depths will improve the fertility of the majority of the soils to a greater extent than if they are only ploughed very shallow, and this is certainly so, although the operation of the former is more costly than the latter. Many farmers argue that all soils will produce more if ploughed shallow than if ploughed deep, but this is not so, as the results obtained at Roseworthy Agricultural College show. For the five years 1911-1915 plots ploughed at the following depths produced on the average—

2in.	ploughing	15bush. 27lbs.
4in.	"	16bush. 19lbs.
6in.	"	16bush. 22lbs.
8in.	"	17bush. 19lbs.
10in.	"	17bush. 13lbs.
12in.	"	17bush. 28lbs.

Details of these plots are also to be found in the report referred to above.

Summary.

1. Cultivation is not necessary to the growth of plants, but is necessary to the good growth of cultivated crops.

2. Cultivation deepens the soil and so allows us to crowd more plants on a given area than would grow there naturally.

3. The water requirements of plants is enormous, and cultivation helps the plants by allowing more of the rain that falls to enter the soil.

4. Cultivation helps the soil to retain more moisture by breaking the continuity of the film surrounding the particles and so reducing losses by evaporation.

5. Mineral matter to be available to plants must be soluble in soil moisture, and cultivation by exposing much of the soil to weathering agents increases the amount of available mineral matter.

6. Cultivation encourages the activities of the useful soil bacteria.

7. Cultivation destroys the robbers of plant food, oxygen and moisture—the weeds.

8. The success of cultivated crops is very largely dependent on a good seed bed, which for wheat consists of soil that has been ploughed up, freed from weeds, and so worked down that the underlayers are very compact and only the immediate surface is loose; all cultivations lead ultimately to the formation of the seed bed.

9. Well worked early bare fallow is the simplest way to produce a good seed bed for wheat in this State.

10. Land ploughed after the heavy rains have finished should be rolled to compact it sufficiently to fulfil the requirements of the seed bed.

11. For the good of most soils, and so for the good of the State, soils should be ploughed deeper than is the usual practice.

FEED FOR PIGS.

"The principal constituent required for feeding pigs is protein, and this element is supplied in separated milk; whole milk, testing 5 per cent. fat, possesses too much fat for pigs to assimilate to advantage," remarks the Dairy Expert (Mr. P. H. Suter). "The composition of milk testing 5 per cent. butter fat is:—Water, 85.9; fat, 5.0; casein, 3.0; sugar, 5.0; albumen, .4; ash, .7; and that of separated milk—water, 91.15; fat, .1; casein, 2.9; sugar, 4.8; albumen, .38; ash, .67. If it is desired to reduce the whole milk to the fat basis of separated milk, it will be necessary to add 500galls. of water to every 100lbs. of whole milk. It is rather an expensive procedure to feed pigs on whole milk, when a cheaper class of fat can be secured. As to the practice of diluting pure milk with water to put it on an equal basis with separated, it will be noticed from the composition of whole and separated milk that they are about equal in solids, not fat; it is therefore necessary to reduce the fat content until it is the same as the separated. Give the food in a sloppy condition when the pigs are young, and gradually increase the consistency as the animals advance in age. When they require water, they will appease their thirst, and it is very poor policy to load the stomach of the pig with water in order that they may consume a small portion of the solid matter."

THE AGRICULTURAL BUREAU.

THE TWENTY-SEVENTH ANNUAL CONGRESS.

(Continued from page 296.)

WHEAT YIELDS PAST AND FUTURE, WITH A REFERENCE TO THE PRINCIPAL FACTORS THAT GOVERN THEM.

An address on "Wheat Yields, Past and Future, with a Reference to the Principal Factors that Govern Them," was read by Professor Arthur J. Perkins, Director of Agriculture, as follows:—

Introductory.

The general progressiveness of any country in the main lines of work which occupy the activities of its inhabitants may be gauged in various ways; but when that country is dependent almost exclusively upon rural production, I know of no more striking criterion in this connection than the rate of improvement shown by the average acre yields of its main crops over successive periods of time. Here in South Australia we are so essentially a wheat growing community, that for the present at all events, the measure of our general agricultural progress must be read in our apparent ability to handle wheat to increasing advantage. And whilst I know that we have no particular reason to feel ashamed of our past, I do not anticipate that any one of us imagines that we have as yet reached our zenith as wheat growers. It should be noted that even at the present time progress continues to be registered in countries in which wheat has been grown continuously for thousands of years, and we who have scarce emerged from the pioneering stage can have no reason to doubt that we shall as time progresses be able to improve on our present average yields. I propose this evening to discuss some of the more obvious facts which I imagine will act as chief contributing cause to future progress. At first, however, I shall ask you to consider what forward steps have already been taken in the course of 60 years of farming.

Past Progress in Wheat Growing.

In this connection it must be stated that with the average individual the returns from single years show a tendency to stand out rather too prominently in the foreground, and according as temperamentally we are inclined to pessimism or optimism, we remember the lean or the fat years, to the exclusion of the intermediate ones, which should alone enter into rational calculations. Neither the lean nor the fat years can convey a true picture of the average productivity of any

country; alone the mean returns from a sufficiently large number of consecutive seasons can do this. Ten years, or a decade, represent for the purpose both a reliable and a convenient period of time, and in Table I. I have endeavored to show what has been our progress as wheat growers over the five successive decades extending between 1866 and 1916.

TABLE I.—SHOWING PROGRESS IN SOUTH AUSTRALIAN WHEAT GROWING BETWEEN 1866 AND 1916.

Successive Decades.	Average Area under Wheat for Grain. Acres.	Average Yield per Acre. Bushels.
1866-7 to 1875-6	665,358	.. 9.48
1876-7 to 1885-6	1,567,878	.. 6.25
1886-7 to 1895-6	1,683,515	.. 5.98
1896-7 to 1905-6	1,753,753	.. 5.37
1906-7 to 1915-6	2,091,420	.. 9.85

That in the earlier years of settlement we should have opened with the comparatively high average of 9½bush. to the acre is comprehensible enough; the area sown at the time was relatively insignificant and probably restricted to the choicer localities. But as settlement extended and areas under wheat assumed greater importance, our yields appear to have fallen away very rapidly, and for the 30 years preceding the last decade the average wheat yield was consistently below 6bush. an acre. There are no doubt many and sufficient reasons for these low figures, and chief among them, probably, the fact that settlers were dealing with virgin areas as yet incompletely reclaimed from scrub and forest; perhaps, too, it must be admitted that in those years we had not as yet mastered the art of growing wheat successfully under local conditions of climate and soil. Whatever may have been the case, however, in these earlier years, a rise from 5 1-3bush. to close on 10bush. to the acre in the last decade represents very solid progress indeed. Nor was this improvement in yields achieved at the expense of the area under crop, since whereas in the three preceding decades the area under wheat showed an average increase of about 10,000 acres per annum, this increase rose to an average of 25,000 acres per annum between 1906 and 1916.

The value to the State of this progress in the art of wheat growing can be translated into terms of hard cash. Taking wheat at average pre-war prices, it represents for the 10 years under consideration an addition to general State revenue of close on 16½ millions sterling, or over one and a half millions per annum.

Hence after 30 years of comparative stagnation our agricultural interests have in the last decade taken a very substantial step forward, and it is for us to consider whether in the next decade we can make

still further progress. Are we going to rest satisfied with an average yield, good year, bad year, of about 10bush. to the acre? Last season there were in South Australia nearly 2,750,000 acres under wheat for grain, and there is every reason to suppose that as an annual average this area will be exceeded during the course of the next decade. Every increase of 1bush. above the average yield of the preceding decade will, therefore, at normal rates represent to the State an additional return of at least £500,000 per annum.

General Position of the Wheat Growing Countries of the World between 1908 and 1912.

There are, of course, limits to the possible profitable increase in the average yields of crops; and before taking into consideration steps that would probably lead to an improvement in our own position, it is important that we should realise what has already been done in older wheat growing countries. And for the purpose I have summarised below in Table II. various data relating to the principal wheat growing countries of the world between 1908 and 1912.

Table II.—Showing Wheat Returns from Chief Wheat Growing Countries of the World (1908-12).

	Average Yield per Acre. Bushels.		Average Total Crop Yield. Bushels.
1. Belgium	37.81	..	14,747,000
2. Netherlands	35.51	..	4,830,000
3. United Kingdom	31.77	..	59,087,000
4. New Zealand	31.02	..	7,763,000
5. Germany	30.77	..	145,552,000
6. Sweden	30.06	..	7,149,000
7. Japan	20.45	..	23,729,000
8. Austria	19.86	..	59,745,000
9. Canada	19.18	..	168,851,000
10. France	19.02	..	306,479,000
11. Hungary	18.13	..	167,890,000
12. Bulgaria	17.41	..	46,711,000
13. Roumania	16.67	..	78,491,000
14. Servia	14.72	..	13,810,000
15. Italy	14.53	..	171,366,000
16. United States	14.03	..	668,798,000
17. Spain	13.54	..	127,997,000
18. **Australia**	12.13	..	82,347,000
19. India	11.75	..	344,957,000
20. Uraguay	11.68	..	7,955,000
21. Argentina	11.18	..	170,713,000
22. **South Australia**	11.18	..	22,145,000
23. Russia in Asia	9.95	..	163,972,000
24. Russia in Europe	9.62	..	520,814,000
25. Algeria	9.38	..	32,089,000

In this Table I have placed the various countries in order of merit of their average acre yields, and not in the order of importance of their total production. I have done this advisedly, because I wished

to emphasise the relative state of advancement attained to by the wheat-growing countries of the world; and in contemplating their achievement we shall, I am afraid, find little to boast of in our own present-day averages; we come, indeed, perilously near the bottom of the list. The lower yields of Russia in Europe and of Russia in Asia are in a measure set off by enormous areas under crop; and in reality there is but Algeria alone, with its primitive native farmers, to save us from bringing up the rear.

An examination of Table II. will show that from the point of view of present yields the wheatgrowing countries of the world fall into several distinct classes.

In a class by themselves are those few countries in which average yields exceed the 30bush. limit; these are countries in which skill and enterprise make the most of favorable conditions of both climate and soil. And in these times, shall we not view with admiration martyred Belgium, one of the most densely populated regions of the earth, one of its chief industrial centres, leading the world also in the production of wheat? It must, however, be recognised, I think, that in these privileged countries, climate is a very essential factor in the realisation of uniformly high yields. No country in my view, however great the skill and efforts of its farmers, is likely to attain to a general average of 30bush. of wheat to the acre unless it is able to raise, with uniform success, what are known as the winter varieties of wheat. And this, indeed, is the case for the six countries included in our leading class; it may ultimately prove to be the case, too, for Japan, for Austria, for Canada, for Hungary, and even for France; but hardly for the balance of the wheat-growing countries of the world, excepting over limited areas of their territory.

The second class may be said to include those countries which I have just named, whose present yields are, for a variety of reasons, relatively low, but which may, in later years, entitle them to take rank in the first class.

In the third class must be placed the balance of the wheat-growing countries of the world in which climatic conditions are generally less favorable to high yields; and as soon as we find time to settle down to more thorough methods of cultivation, there appears to me no valid reason why we should not, in the course of time, take a leading position in this class. If countries like Bulgaria and Roumania are able to secure general averages of 16bush. to 17bush. to the acre, there are no physical reasons which can hinder us from doing equally well, if not better.

PROBABLE STATE MAXIMUM DECENNIAL WHEAT AVERAGE.

What, then, it may be asked, is the highest decennial average wheat yield to which in the course of time South Australia may legitimately aspire? This is not a question that admits of a summary reply. It may be possible to forecast, with sufficient accuracy, future maximum yields for an individual farm with which one is familiar; it may be logical to extend these conclusions to neighboring lands similar in character; it may even be tolerably safe to do so for other districts in which conditions are supposed to be more or less similar; but to endeavor to measure the future rate of progress of a vast area of agricultural land covering every type of climate and soil, is a task not easy of solution. In this connection I think that we shall probably agree that in any country maximum yields are influenced chiefly by the following factors:—(1) Local climate; (2) soil characteristics; (3) cultural methods and practices; (4) prevalence of diseases and pests; (5) economic conditions. Of all these factors, I think that in the matter of maximum yields it is the influence of climate that counts most—it is an absolute factor, and not a relative one, and one which our own efforts can do little or nothing to mitigate. I have already had occasion to refer in a general way to this influence of climate on possible wheat yields; the point raised, however, is of sufficient importance to bear emphasising here. It should be clearly understood that whatever may be the yields secured in other countries differently situated, local climate fixes definitely for us a local limit beyond which we cannot hope to rise. Thus, independently even of the vagaries of our rainfall distribution, which we know not to be negligible, local conditions are such as to limit the period of growth of a wheat crop to six or seven months, according to seasons and districts. Experience, on the other hand, shows that this relatively short period of time is altogether insufficient for the successful exploitation of the heavy yielding winter wheats, which demand, as a rule, a period of growth extending into 10 months. Hence, however great and well directed our efforts, a climate which confines us to the cultivation of relatively low-yielding spring types of wheat will never permit us to emulate the yields of Belgium and New Zealand. And whilst I must recognise that in certain seasons and in certain districts individual yields of 40bush. and over can and have been, realised in South Australia, I am of opinion that our general climatic conditions are such as to render 20bush. to the acre an extreme maximum, so far as we are concerned, in the way of a general State decennial average. That we should be able to rise, however, from 10bush. to 20bush. would represent an enormous stride in progress, and I can hardly hope that it will be realised in our time.

Such an advance would imply not only radical changes in our general methods and practices, but in addition the incidence of overwhelmingly favorable economic conditions.

AVERAGE YIELDS IN THE STATISTICAL DIVISIONS AND THE COUNTIES.

I have dealt hitherto with our average wheat yield from the point of view of the State taken as a whole. It should be realised, however, that our acreage under wheat is not stationary, that it increases from year to year, and that every season sees new acres under wheat reclaimed from scrub or grass. And unquestionably these new areas exercise at first a depressing influence on the general State yield. In the circumstances State averages fail to bring out sufficiently the real progress which has within recent times been effected in our older settled districts. It will be of interest, therefore, to consider at closer quarters average yields in the decade under consideration. And in the first place let us examine these yields from the point of view of the large divisions adopted by the Statistical Department as summarised below in Table III.

TABLE III.—SHOWING AVERAGE WHEAT DATA FOR THE STATISTICAL DIVISIONS OF SOUTH AUSTRALIA, 1906-1916.

	Average Yield per Acre. Bushels.	Average Total Production. Bushels.	Average Total Acreage. Bushels.
1. Lower North	12.45	7,464,161	599,531
2. Central	10.39	6,430,527	618,915
3. South-Eastern	8.33	1,856,257	222,840
4. Upper North	8.23	2,318,745	281,733
5. Western	6.76	2,488,248	368,084

The Lower North Division, which headed the list of wheat averages during the last decade, owes this position not only to its great value as farming country, but also to the fact that there is within its boundaries but little land as yet unreclaimed for wheat. In the Central South-Eastern, and Western Districts, on the other hand, large tracts of country have within recent years been thrown open to cultivation, and the low yields from these imperfectly reclaimed areas have during the last decade had a depressing influence on the average yields of the Divisions concerned. And we may anticipate that as farming becomes more normal in these new areas the average yields of the Divisions will show considerable improvement. Low yields in the Upper North Division, on the other hand, are, as is well known, the unavoidable consequence of a low and uncertain rainfall.

An examination of the yields of the counties will give us an even closer insight into the wheat-producing capacities of our various districts. I am afraid that local geography is very much neglected in our midst; and I have frequently been astonished to find that rural

nbers of the community are not always aware of the name of the nty in which their farms happen to be situated. I have, there-, thought it well to inscribe the average yields of our wheat-wing counties on a map specially prepared for me by the kindness he Surveyor-General, Mr. E. M. Smith. This map may be taken llustrate Table IV., which is given below.

LE IV.—SHOWING AVERAGE WHEAT DATA IN WHEAT GROWING COUNTIES, 1906-16.

unties.	Division.	Average Yield per Acre.	Average Total Production.	Average Total Acreage.
Grey	S.E.	14.61	83,058	5,685
Light	C.	14.12	1,260,492	89,270
Stanley	L.N.	13.56	2,407,171	177,520
Victoria	L.N.	13.53	1,993,984	147,375
Burra	L.N.	12.28	318,408	25,929
Fergusson	C.	12.19	1,643,943	134,860
Adelaide	C.	11.62	144,425	12,429
Daly	L.N.	11.57	2,626,205	226,984
Gawler	C.	11.49	1,302,656	113,373
MacDonnell	S.E.	10.27	61,158	5,955
Robe	S.E.	9.97	60,348	6,053
Frome	U.N.	9.83	1,097,991	111,698
Buckingham	S.E.	9.69	299,654	30,924
Hindmarsh	C.	9.66	169,465	17,543
Dalhousie	U.N.	8.94	848,621	94,924
Chandos	S.E.	8.91	906,913	101,786
Alfred	C.	8.41	426,791	50,748
Le Hunte	W.	8.04	7,035	875
Musgrave	W.	7.92	160,237	20,232
Sturt	C.	7.90	506,674	64,136
Jervois	W.	7.89	780,826	98,964
Eyre	C.	7.63	499,239	65,431
Flinders	W.	7.60	468,251	61,612
Buxton	W.	7.40	10,197	1,378
Robinson	W.	6.84	423,499	61,915
Kimberley	L.N.	6.76	108,315	16,023
Albert	C.	6.61	459,071	69,451
Hopetoun	W.	6.43	76,337	11,872
Russell	S.E.	6.35	151,771	23,901
Herbert	U.N.	6.33	52,678	8,322
Buccleuch	S.E.	6.26	282,082	45,061
Carnarvon	C.	6.01	10,061	1,674
Cardwell	S.E.	5.91	22,830	3,863
Dufferin	W.	5.89	53,458	9,925
Newcastle	U.N.	5.88	135,587	23,059
York	W.	5.79	5,859	1,012
Manchester	W.	5.71	634	111
Way	W.	5.42	425,519	78,509
Young	L.N.	5.20	29,089	5,594
Kintore	W.	4.99	113,677	22,781
Blatchford	U.N.	4.73	39,557	8,363
Glanville	U.N.	4.22	63,549	15,059
Hanson	U.N.	4.16	84,693	20,359

Thus, then, over 14½bush. in County Grey, and under 4½bush. in unty Hanson, represent respectively the extremes in our county eat averages between 1906 and 1916. It is evident, therefore, that

even in our most fertile and earliest settled districts we are not yet within sight of the maximum State average that climatic conditions would appear to permit of. At the same time, apart from a few exceptions, the Counties of the Central, South-Eastern, and Western Divisions must tend automatically, and without any very special effort of their own, gradually to improve their wheat-yielding position as normal farming practices become general over the newly settled area. Enhancement in yields in the Lower North, on the other hand, and in some of the older settled Counties in other Divisions, must depend very largely in future decades on improved methods, and perhaps, too, on the reduction in area of individual farms. Finally, in the Upper North, apart from Counties Frome and Dalhousie, rainfall conditions are, on the whole, far too uncertain to render probable any very material improvement in decennial average yields.

Average Wheat Yield on Roseworthy College Farm and Neighborhood.

We have now considered average wheat yields from the point of view of the State as a whole, from that of the large statistical Divisions, and from that of individual Counties. I propose next illustrating the position from the standpoint of an individual farm, with the general conditions of which I am perfectly familiar. I refer to the farm attached to the Roseworthy Agricultural College. On this farm harvest results have been noted and tabulated with great care for the past 12 seasons. From these data conclusions as to the agricultural possibilities of the district in which the farm is situated appear legitimate; and if speculative generalisations be admitted, these conclusions may perhaps be given even wider bearing. Long personal experience of the Roseworthy district, and tolerable acquaintance with the rest of the State, have led me to believe that both in the matter of climate and soil the Roseworthy Agricultural Farm represents very fairly the average agricultural conditions of South Australia. Hence I am inclined to believe that maximum average results in wheat yields obtainable on this farm are likely to represent the extreme limit beyond which climate and soil will not permit a State decennial average to rise.

Between 1904 and 1916 (12 successive seasons) the average area under wheat for grain on the College Farm was represented by 268 acres, and the average acre yield therefrom by close on 17½bush., with a maximum of 25.08bush. in 1909 and a minimum of 6½bush. in 1913. Clearly an average of 17½bush. is measurably less than the 20bush. which I believe to represent the true agricultural capacity of the district, and our extreme maximum in the way of future State decennial averages. In explanation of this apparent discrepancy, it should b

stated that practically all College crops are handled for experimental purposes, and as such are not calculated, in many instances, to yield maximum returns. One example will perhaps serve to illustrate the position. Long experience has shown the types of wheat that are peculiarly adapted to College conditions; and yet, year after year, these types can only be allowed to occupy a more or less important fraction of the area sown, because of the importance of raising pure seed of various types for State purposes, and of testing, from time to time, on a large scale, new varieties which have shown promise in other districts. In these circumstances, although the maximum will be exceeded in favorable seasons, the College average wheat yield over an extended period of time cannot be expected to reach the possible maximum for the district, which should, in my opinion, be within the neighborhood of 20bush.

If now we turn to the district in which the College is immediately situated, viz., the District Council of Mudla Wirra North, we find that between 1904 and 1916 the average area under wheat was 8,122 acres, and the average acre yield 13.36bush., with a maximum of 24bush. in 1905, and a minimum of a little over 2bush. in 1914. This is an old settled district, chiefly a hay-growing one, it is true; but I confidently look forward to the time when its decennial wheat average will not be far short of 20bush. to the acre.

Influence on Average Wheat Yields of Soil, Cultural Methods, and Diseases.

I have already indicated the existence of other factors whose influence may tend to depress the maximum average yield which climatic conditions otherwise render possible. I propose now examining briefly each one of them.

In the matter of general soil conditions we have, I think, little to complain of relatively to the position of other countries. Good wheat land, it is true, is rightly described as "heavy land"; and given an adequate rainfall, land of this type will, no doubt, carry heavy crops of wheat. We have in this State land both light and heavy, although perhaps in point of view of total area the former tends to predominate over the latter. There is, however, sufficient local experience to show that our lighter types of soil carry wheat far more satisfactorily than might have been anticipated from the experience of moister countries; indeed, in many districts these light lands are the standby of the farmer in years of light rainfall. Fortunately, too, the bulk of our soils are more or less calcareous in nature, and therefore adequately stocked with lime, whilst we have learnt to meet their almost universal low tenor in phosphoric acid by the intelligent use of phosphatic

manures. In brief, then, there is nothing in the character of our soils to lead us to modify any estimate of possible State averages based on a consideration of climatic conditions.

The influence of cultural methods and practices must evidently be very great at all times; and our present relatively low averages are partly the natural consequence of unavoidable pioneering methods. There can be no doubt, on the other hand, that if we are ever to attain to the maximum averages that climate and soil permit of we shall have to fall back upon methods of cultivation more in keeping with intensive farming operations.

Of diseases and pests, so far as we are at present aware, red rust alone is really to be feared; and even in the latter case we have reason to believe that in the course of time localised varieties will acquire a considerable degree of immuneness against rust. It is true, of course, that the various smuts, take-all, &c., have in the past taken annual toll from our crops; and they will probably continue to do so in the future. It is nevertheless a fact that losses from these diseases would, on the whole, be infinitesimal did we but adhere strictly to rational lines of prevention or treatment. Here, again, if we except perhaps occasional serious outbreaks of red rust, which we hope in time to be able to control, I see no greater danger to our future decennial State averages from the action of diseases and pests than obtains normally throughout the world in other wheat-growing countries.

Influence of Economic Conditions on Average Wheat Yields.

And, finally, there is the incidence of economic conditions. A detailed examination of the latter would involve us in questions of exceptional intricacy, nor can it be undertaken. The general bearing of these conditions is, however, simple enough. Thus it may be said in summary, that however much climate, soil, and efficient technical practices may combine to render possible certain agricultural results, the latter must remain nugatory unless general economic conditions allow of their being achieved at a profit to the landowner. Hence, in ultimate analysis, the farmer's interest in economic conditions is represented by the cost of production on the one hand, and prices realisable for his produce on his farm on the other.

Now, I think that in spite of our natural tendency to grumble, we shall have to admit that, on the whole, over the past decade economic conditions were generally, if not abnormally, favorable to the farmer. Indeed, we cannot escape the admission unless we wish to assert the practical bankruptcy of the farming community. It may, it is true, be argued that but for the timely aid of various side lines, wheat growing alone would not have proved profitable; but even if we should

accept this view—and it is unquestionably correct in some instances—it cannot be said to invalidate the original argument. Indeed, it may be insisted that only in the initial stages of settlement of a new country can wheat growing alone be followed as a profitable occupation; that we have outgrown this stage; and that in present circumstances the farmer, whilst retaining wheat as his main objective, must combine with it other lines of activity; and the latter, far from embarrassing his main crops, will probably serve to strengthen their economic position.

We have in the present condition of the British Isles a very clear-cut example of the results on wheat growing of unfavorable economic conditions. In 1874 the area under wheat in the United Kingdom was represented by 3,819,011 acres, whilst between 1908 and 1912 the average yearly area was only 1,859,836 acres, a decrease of close on two million acres, or over 51 per cent.; and this may be represented as the direct consequence of the free competition of foreign wheat, a very important economic factor. Those who wish to argue against the local profitableness of wheat growing, should not forget that over the last decade the area under wheat in South Australia increased at the average rate of 25,000 acres per annum; and that in no earlier decade was the extension of the area so marked.

I shall assume, therefore, that between 1906 and 1916, with average yearly yields of 9.85bush. per acre, economic conditions were not unfavorable to the local wheat grower. Over the same period the average Port Adelaide price for wheat was about 4s. 2d. a bushel (including the exceptional average price of 7s. 3d. a bushel which obtained in 1914-15). This figure, of course, does not represent the average price realised by the farmer; allowance has still to be made for the average cost of conveying the grain to the seaboard, which, for general purposes, may be taken to be represented by 3d. a bushel. We may conclude, therefore, that the average price realised by farmers in the last decade was about 3s. 11d. a bushel; and with an average yield of 9.85bush., this would represent an average gross return of 38s. 7d. per acre.

What, on the other hand, has been the average cost of production? I have seen this variously estimated; and even in one and the same district no two estimates appear to be in complete agreement, probably because in such questions the personal factor is still of supreme importance. In the circumstances, therefore, I shall not attempt to put forward any new estimate purporting to represent the average cost of production of wheat for the whole State. Unless, however, we are inclined to put in doubt the solvency of the community, we are bound to agree that this cost of production in the preceding decade must have been below 38s. 7d. per acre, or at all events not in excess

of it. In the first case, wheat-growing will have left to farmers an annual profit which will have varied with circumstances; in the second one, it will at all events have assured them fair wages in a congenial occupation.

In conclusion, therefore, if relatively to other countries our average yields of wheat are still low, so also is our average cost of production. Nor should it be overlooked that we cannot hope to increase these yields in the decades that are before us without incurring corresponding increases in our general expenditure. Ultimately, no doubt, we shall come under the influence of the law of diminishing returns, and we may even have to realise that certain increases, however attractive, are too costly to be economically sound. We are, however, as yet, many decades distant from any such contingency.

Factors that Lead to Better Yields.

From the past and its achievements we must now turn to the future and its anticipations, and I suppose that without exception we all believe that between 1916 and 1926 our decennial State wheat average will continue its progressive rise. In this connection I propose now examining briefly various factors which should in my view lend a helping hand towards that end.

Complete Reclamation of New Land.

The factor from which we may expect most—because of the certainty of its incidence—is the gradual reclamation of recently cleared land which has within latter years been put under crop. It is worth noting that between 1907 and the present time close on two and a half million acres of scrub land have been cleared, and from time to time put under wheat. Now we all realise that in referring to areas of this kind as "cleared," and notwithstanding the crops they have been made to carry, we do not wish to imply that the land in question has been completely reclaimed to farming purposes. It grows wheat, it is true; but with it mallee shoots as well; and even when the latter have been completely eradicated, their underground stems and surface roots continue for many years to hamper normal farming operations, and to be reflected in crop yields which are certainly below a reasonable normal average. And since in this State mallee land covers a very appreciable proportion of our farming areas, it is not until all this land has been completely and thoroughly reclaimed that we can hope for a high all-round State wheat average.

Unfortunately the methods of the average mallee farmer are not generally calculated to hasten on this desirable end. It is not my intention, however, to discuss these methods at any length to-day. I

freely admit that the mallee would never have been touched within our time had not some such rough and ready treatment as rolling and burning been devised. What I do feel, however, is that the period of definite reclamation is as a rule unduly prolonged, and that at times so long is the process that scrub practices become part and parcel of the mallee farmer's nature, and that in the end he is unable to understand farming apart from a constant struggle with roots and shoots. Needless to add that in such circumstances it is not easy to secure very satisfactory average yields.

The gentle art of criticism and advice giving is easily indulged; its helpfulness, on the other hand, is often marred by the inability of the critic to project himself mentally into the other fellow's place. Undoubtedly at Roseworthy I had many years' farming experience of mallee land, and am, therefore, able to judge of its ultimate agricultural possibilities; unfortunately, however, my personal experience has never extended beyond land which had already been cleared by others; hence, it is perhaps difficult for me to form a true mental picture of what a daily struggle with virgin mallee really implies. I am, however, sufficiently acquainted with facts to know that with the average mallee farmer it is not so much a question of good or bad farming as one of individual finance, and that in attempts at its solution the struggle to keep body and soul together is often sufficiently intense to render the means employed more or less a matter of indifference. It is, therefore, with a full knowledge of my shortcomings as a critic that I submit for consideration the following propositions relative to the handling of mallee country and the future thereof:—

1. In present economic conditions preliminary rolling and burning is the only practicable way of winning over the mallee to normal farming.

2. But not until they have been completely freed of roots and shoots will mallee farms reach their maximum wheat producing and grazing capacities.

3. Undue length in the reclamation period, or an attitude of "live and let live" towards the mallee, is not only costly to the holder, but the fruitful source of slovenly practices, which it will take years, if not generations, to overcome.

4. In the mallee, as elsewhere, fire is an excellent servant, but an undesirable master. In the early stages of reclamation the mallee farmer cannot do without his services; but failure to dismiss him at the earliest opportunity implies indifference towards complete reclamation, which should be the chief aim of the conscientious settler.

5. It is not denied that "firing" some types of virgin land has apparently a stimulating influence on the present crop producing

capacity of the latter. As such, however, "firing" represents no more than a short cut to results which may be attained more slowly, it is true, but at less expense to ultimate fertility, by good honest ploughing.

6. A long reclamation period implies repeated "firings"; the growing of crops year after year on the same ground; the gradual invasion of the land by weeds; the inevitable spread of takeall and smut, &c. And the only sure cure to difficulties of this nature is the complete eradication of shoots and roots as soon as this becomes economically possible.

7. The mallee farmer is unwise, indeed, who measures his progress by the square miles of country he has been able to roll and burn; infinitely more profitable are 100 acres thoroughly reclaimed than an area three or four times as great on which wheat and mallee wage an unequal contest. And I look upon any legislative measure which compels the new settler to level down yearly a given area of virgin country, whatever the means at his command, as conceived in the interest neither of the settler nor of the State.

Improvement in Yields of Settled Districts.

But if wheat yields are certain to increase almost automatically over those areas of country but recently under scrub, we cannot entertain the same certain hope where older settled land is concerned. And yet we have to face the fact that yields such as 13bush. or 14bush. to the acre in old settled counties like Light, Stanley, or Victoria are very far from satisfactory. Indeed, we know that in these selfsame counties the averages of many and many a farmer are not far from double these figures. The inference then is that, whilst we have many excellent farmers in our midst, there are others, on the other hand, whose methods might, with a little good will, be improved upon to the great advantage of the State. As likely to help in this direction, I summarise below a few propositions with some of which you will probably agree.

Influence of Education.

1. The unsuccessful farmer, or at all events the farmer whose success is not equal to his opportunity, is depriving the State of the enjoyment of some portion of its natural wealth. Hence, apart from questions of good fellowship, his more successful neighbors have a direct interest in him and his doings. Let them get him to join a branch of the Agricultural Bureau in the hope that an interchange of ideas with his fellows may lead to the practical appreciation of better methods. The first step towards progress, therefore, is essentially educational in character, and I realise that in this direction the Department of Agriculture shares an equal responsibility with the progressive farmers of the State.

More Thorough Tillage.

2. From the point of view of high average State yields, our greatest weakness lies probably in the direction of soil tillage; and it is natural that this should be so. We are still pioneer settlers of vast areas of land; we are still holders of larger areas than we are able individually to exploit, because as a rule we cannot command the necessary capital thereto. And it follows that the man whose means admit of cropping well, say 200 acres, slurs over his tillage when he attempts to handle 400. And unfortunately at times both season and results appear to justify him in his action. Who has not heard of the man who scratched in a second crop and reaped quite as good results as his neighbors from well-worked fallow? Nevertheless, if we take the general average, we shall find that it is good honest tillage that counts in the long run, and that it is the man who systematically attempts to put in more than his means admit of who is largely answerable for our low State yields. Better far that he should sell half of his land and utilize the proceeds towards increasing his working capital.

Our tillage operations usually lack thoroughness and the characteristics of a workmanlike job. In the hands of an expert spade work approaches the ideal in soil tillage. On the farm no doubt the spade has long been dead, and I am not advocating its resurrection, except perhaps as evidence that kitchen gardens, flower gardens, and orchards are to become more common on our farms than has hitherto been the case. I mention the spade, however, because it should be the aim of good plough work to approach the ideal as nearly as possible. In ordinary circumstances, however, what, as a rule, do we see? A tendency to reduce directing man power to a minimum; to multiply furrows indefinitely; to reduce furrow widths to an often ridiculous minimum; to endeavor to work with a fraction of a horse to a furrow; and to cling tenaciously to unwieldy stump-jumping implements, simply because they were indispensable in days gone by. And unless the field be of billiard-table levelness and of perfect evenness of texture the natural result is individual plough bodies working with glorious independence, some biting deeply into the soil, others sliding merrily over it or just below the surface; hence bad tillage, unavoidable unevenness in depth, hard patches that are no more than scratched over, furrow slices that are set on edge but not inverted, and a few weeks later the field as green or as yellow as if a plough had never been near it. And, above all, we have a horror of driving our ploughs deeply into the ground, and thus deprive ourselves voluntarily of one of the simplest ways of getting at the natural wealth that lies stored beneath our feet. I do not wish to imply that these strictures apply to the whole farming community, or even to the majority of us; it is

sufficient, however, that an important minority should deserve them to see their influence reflected in a relatively low State wheat average.

Less fault can be found with subsidiary tillage operations, such as cultivating and harrowing, which usually complete the work of the plough. I should like to point out, however, that apart from exceptional cases of very cloddy land, rollers appear to be entirely overlooked by us as necessary tillage implements, and if availed of at all are usually too light to be really effective. And yet, if we could but realise it, whether the land be light or heavy, rollers can be made to do very profitable work in the way of preparing the land for wheat; particularly is this the case for land broken up late in the season. In my view all land intended for wheat and broken up after July rains should be heavily rolled as early after ploughing operations as possible—at harvest time the value of this treatment may be measured in bushels.

Phosphatic Manures.

3. In any assessment of the factors that have led to local improvement in the agricultural outlook, it cannot be said that we are prone to overlook the part played by manures; and whilst I will not go so far as to say that we over-estimate the latter, I am satisfied that we often under-estimate the value of improved tillage methods. Whatever may be said on this score, however, there is no denying the extraordinary success of soluble phosphatic manures in South Australia—of them, relatively to the rate of progress usual in other agricultural reforms, it may almost be said that they came, they were seen, they conquered. In 1897 about 2,000 tons of artificial manures were used in South Australia; in 1914, *i.e.*, 18 years later, the quantity used had risen to over 97,000 tons. The extraordinary progress effected in so short a period of time is all the more remarkable in that it involved a radical and costly change in seeding practice, namely, the substitution of the seed-drill for the broad-caster. It was only a few years earlier—in the late eighties—that the first Principal of the Roseworthy Agricultural College, Professor Custance, who was at the time endeavoring to impress the value of the seed-drill upon South Australian farmers, was caustically advised to place it in the College Museum, as an ancient relic of historic interest no doubt, but of no possible practical value.

But if farmers, as a class, are unquestionably very much alive to the importance of superphosphate in South Australian farming nothing like unanimity exists as to the dressings that can be applied to best advantage. Light dressings of superphosphate—at times as low as ½cwt. to the acre—have frequently given rise to very striking

results; hence naturally a rather general tendency to restrict the average dressing to the smallest quantity possible. And the general result to-day is, I think, that farmers as a whole dress their wheat fields with smaller quantities of superphosphate than is their personal interest to do—in other words, an all-round increase in the quantity of superphosphate used would almost instantaneously lead to an appreciable rise in our general State wheat average.

I have already admitted that some increases in yield can be bought at too high a price; that if, for example, the cost of the additional manure used should exceed the market value of the average crop increase, there could certainly be no advantage in the use of heavier dressings of superphosphate. It must be admitted that in this connection the general position is complicated by economic considerations; thus, variations in prices of wheat and manure respectively are not necessarily compensating; similarly, an increase in crop which is profitable with wheat at 4s. a bushel may not be so with wheat at 3s. 6d. Fortunately, however, from the point of view of his livestock interests, the indirect benefits to the farmer of heavy dressings of superphosphate are so great that one can safely recommend them so long as crop increases just about balance the cost of the additional quantities of manure used.

It must be agreed, however, that absolute uniformity in the matter of dressings cannot be expected over a vast extent of country such as our own, and in matters of this kind it must be left to each district gradually to develop its own line of policy. Personally, I am perhaps rather inclined to lean on such experience as I was able to acquire at Roseworthy. Fortunately, however, we now have several Government farms, distributed over different portions of the State, and from the experiments that are being conducted on them I am endeavoring to realise the position from the point of view of the districts in which they are placed. I may be permitted to repeat here that at Roseworthy I found a 2cwt. dressing of superphosphate more profitable than lighter dressings, and I made it the standard dressing of the farm. I believe that the indirect benefit on pasture of this rather heavy dressing has been evident to all those who have visited the institution within recent years. On the other hand, dressings of superphosphate in excess of 2cwt. to the acre were hardly ever profit-bearing at Roseworthy. Such, then, was our experience in one district, and whilst I do not wish to maintain that it is likely to be confirmed over the length and breadth of the State, I believe, nevertheless, that it will be found to hold good over many thousands of acres which are at the present time far too lightly dressed.

The fear often expressed that dressings of superphosphate heavier than those one has been accustomed to are likely to lead to blighting off in the crop, is in my experience without foundation, and I have made consistent use of very heavy dressings indeed. As a matter of fact, undue rankness in the crop, which as a rule is one of the contributing causes to blighting off, is not so much brought about by the action of the superphosphate as by the peculiar characteristics of the season itself and their reaction on the natural fertility of the soil. The only type of soil on which the action of acid superphosphate is to be feared is light soil insufficiently supplied with lime. In soils of this character phosphatic manures, if required, should be supplied in neutral form like basic slag; or, even in districts of heavy rainfall, like finely ground untreated phosphatic rock, or again like bonedust.

Other Types of Manures.

4. From the point of view of general farming, phosphatic manures appear to be the only ones in which any interest is at present being taken in South Australia. And yet there is no doubt that in many special cases other types of manures are destined to exercise an important influence on the upward tendency of our future State wheat averages. Thus, even at Roseworthy, where the rainfall is not heavy, we have been able to prove that nitrate of soda, when used jointly with superphosphate, if not actually profit producing, has a very distinct influence on the yields of crops. Over a period of nine years the average increase noted for the use of 1cwt. of nitrate of soda and 2cwt. of superphosphate to the acre, relatively to 2cwt. of superphosphate alone, was about 3bush. of wheat and about 5cwt. of hay. Improvement in yield is therefore undeniable. Unfortunately, however, at the prices that have hitherto obtained for both produce and manure these increases in yield are hardly profit bearing. And whilst I feel certain that equally unsatisfactory results would be secured over the bulk of the State, it does not follow that we have no districts in which nitrate of soda could be used to some advantage. It is quite probable that this type of manure could be used profitably in many of our damper districts wherever the soil is open and porous. Again, the main objection to nitrates—and with them in this connection may be associated sulphate of ammonia—is what appears to me as their unnecessary costliness, namely, not less than £14 a ton at pre-war rates. Within comparatively recent times nitrates have been manufactured fairly extensively from the air, and it is to be hoped that as manufacturing methods improve, it will be possible to place them at the disposal of farmers at far lower prices than have hitherto obtained.

Potash manures have in the past been equally costly; fortunately, however, both our heavier and medium types of soil are so heavily stocked with available potash that from the point of view of most crops potash manures are more or less without appreciable effect; and this is notoriously the case for all cereals. On the other hand, it is quite possible that over some of our lighter types of soil—and of these we have vast areas—potash manures may eventually prove very useful. Any extensive use of them, however, is possible only on an appreciable reduction in prices hitherto asked.

Lime, again, our soils are as a rule amply stocked with; there are, however, a few striking instances of lime deficiency, which, unless adequately met, will condemn soils affected by it to very unsatisfactory wheat yields. The wider use of the practice of liming in our South-Eastern Division, and in much of the country south of the Murray, will help much towards improving the wheat yields of these districts.

Organic Matter.

5. And, lastly, we must consider the influence on wheat yields of he organic matter or humus of the soil; the consideration of such a uestion would appear almost superfluous in virgin agricultural country uch as our own. Circumstances, nevertheless, are such that we are lready unable to overlook it in any discussion relating to the successful growth of almost any type of crop. It may be said, in a general way, that local farming practices deliberately, albeit unconsciously, aim at the destruction of the organic matter in the soil; to treat land as well worked bare fallow for a period of nine or ten months in alternate years implies the slow destruction of enormous quantities of organic matter which past centuries have accumulated in the soil. True, we reap the benefit of this destruction in an appreciable increase of the present fertility of the land. This improvement, however, is made at the expense of future crops; and unless we are prepared to make good the loss, our average wheat yields after a while will tend to decline rather than to increase. There are various ways in which this difficulty may be overcome; of these, however, only one, in present circumstances, is of real practical interest to us; and, fortunately, it is well within the reach of most South Australian farmers. It may be stated, in principle, that the greater the proportion of livestock relatively to area carried by a farm, the greater ultimately its acquired fertility; in other words, grazing, reasonably handled, instead of impoverishing the land, adds to its agricultural value; and this chiefly because it tends to replace organic matter destroyed in the course of tillage operations.

We see, therefore, that crop raising, on the one hand, and livestock handling on the other, react reciprocally and favorably one on the other. Crop raising, if accompanied by heavy dressings of phosphates, leads eventually to stronger and richer pastures, and hence to improved stock-carrying capacity. An improved stock-carrying capacity results in a greater accumulation of organic matter in the soil, which, in its turn, if judiciously handled, means as a rule heavier crop yields.

We may infer, therefore, that the stress of economic conditions which is gradually driving the South Australian farmer towards livestock operations, must in the end react favorably on his cropping returns, and eventually lead to a higher State wheat average.

Seed Wheat.

6. And, finally, as calculated to influence future State wheat yields, I shall mention improvement in the type of seed wheat usually sown. It may be admitted that within recent years many farmers have shown laudable anxiety to secure for their purposes the best type of seed wheat locally procurable; on the other hand, there are others whose concern does not as a rule go beyond the name of the variety which they propose growing. One may, I think, judge of the extent to which the importance of this question is really appreciated by the money value which the average individual is prepared to place upon good seed. It can hardly be maintained that the man who sees no difference in intrinsic value between an f.a.q. sample and good seed wheat knows what good seed wheat is, or what it costs to produce; and yet I have heard views of this kind solemnly put forward by reputedly competent judges. I am afraid that this question of seed wheat is involved in many important issues which I cannot undertake to pursue in detail in the present address. I shall have to confine myself, therefore, to summarising the chief of them in the form of a series of brief propositions.

(*a*) The first essential of good seed wheat is that the variety sown should be pure and true to name, and well adapted to local conditions of climate and soil.

(*b*) There is no particular virtue attaching to the mere act of a change of seed; the careful farmer can, as a rule, raise better seed on his own farm for his own purposes than he can secure from his neighbor.

(*c*) Whilst a progressive farmer may be willing to test on a small scale new varieties apparently adapted to local conditions and well spoken of elsewhere, it is never wise to rush these new varieties in a

wholesale manner at the expense of old and well-tried ones. Those that prove unsatisfactory on a small scale are not likely to prove satisfactory on a large one.

(*d*) All varieties of wheat, unless under the influence of more or less continuous selection, tend to fall back to a fixed dead level of mediocrity, which is naturally fatal to high average yields.

(*e*) We may agree that the regular business of selection on a large scale should be left to experts, who are able to concentrate their time and energy upon the work. Nevertheless, just as the careful farmer leaves the breeding and selection of his rams to the highly trained studmaster, but himself selects his breeding ewes, so the wheat grower is able on his own farm, if he wishes it, to continue on a lower plane the more delicate work of the expert wheat breeder.

(*f*) The farmer who aims seriously at selection work should confine his attention to two or three varieties, at the outside; to take up a greater number would mean, as a rule, dispersal of effort and lack of results.

(*g*) It is as well to realise that selection by "roguing" undesirable plants from a patch of wheat, however small, is never satisfactory, and cannot in any sense be classified as selection work.

(*h*) The only satisfactory method of selection consists in taking as a starting point a single plant of conspicuous all-round merit, or the best ear from such a plant, or, preferably still, individual grains in the best ear of such a plant. Any one of these taken as individuals may be made the starting points of selected strains; and if—as should be done—the connection between them and succeeding generations is retained, we shall have not only selected strains, but pedigreed selected strains.

(*i*) A small number of rows placed in the middle of a field can in each year be made to carry conveniently all the plants that are subject to direct selection. At harvest time the best plants in these rows supply seed for next year's selection operations, whilst the balance of their grain can be sown in the ordinary way, and trusted to supply in the following year sufficient seed for a fair-sized field. Practices of this kind, continued from year to year, constitute in the long run automatically continuous selection.

(*j*) All farmers cannot and will not take up work of this kind. The man, on the other hand, who is willing and able to do so will have no difficulty in making his value felt in his district; in the end it is probable that all his grain will be disposed of to his neighbors in the form of seed wheat, whilst the task of building up the local f.a.q. sample will fall to others.

(*k*) But if every farmer cannot practice regular selection on the lines described, there is not a farmer who cannot grade his wheat if he sets his mind to it. The advantages of sowing graded seed wheat are many, and cannot, I am afraid, be enumerated here. I believe, however, that most farmers recognise the value of the grader, and would make use of it freely were it not, when of satisfactory pattern, a relatively expensive machine. We have here a case in which co-operative action seems clearly advisable. There is nothing to prevent several neighbors joining together in the purchase of one grader, and grading their seed wheat at leisure over the long interval which separates harvesting from seeding operations.

(*l*) Finally, let us insist that good seed wheat is not the same as a good f.a.q. sample. It is wheat that is true to name, that has some sort of recognised pedigree; that is reasonably free from injurious weeds; that consists of well-developed plump grain, from which both shrivelled and broken grain has been carefully removed; and, finally, that has not suffered from exposure to weather. A shilling a bushel above f.a.q. rates is not too much for a sample that complies with all these conditions.

To the extent that these principles receive fuller recognition in the practice of the average farmer, so will they tend to exercise a favorable influence on the State wheat average.

Harvesting Operations.

7. I must refer briefly to one more factor, likely to bring about, however, not so much an actual as an apparent increase in yields. I refer to our harvesting methods. Personally, I am of the opinion that the combination of binder and thresher, besides accumulating much valuable straw, will gather in appreciable quantities of grain which neither stripper nor harvester can, in ordinary circumstances, reach; and it follows that if the former could be substituted for the latter over our harvest fields on anything like an appreciable scale, there would unquestionably be an apparent increase in the State yield. The retort of course is possible that the grain saved by this change of method may be purchased at too great a cost; and whilst I admit that the point is debatable, I believe personally that the grain would be saved at a profit both to the farmer and to the State. The real difficulty lies in the paucity of labor at harvest time; but in this connection what is a real difficulty for the individual can be solved readily enough by a combination of individuals. I see nothing to prevent a combination of farmers threshing their own crops in common with a threshing gang visiting each farm in rotation.

Personally, I cannot look upon the complete harvester as the last word in the way of South Australian harvesting machinery. My predecessor, Professor Lowrie, held similar views on the subject, and once described to me an alternative which appears to me to have practical worth. He pointed out that to drag over a rough field, up dale and down dale, from one end of the day to the other, a complete reaping and threshing plant is, on the whole, a very costly and cumbersome practice. In lieu of it, he suggested that the ears of the wheat plant could be cut off short, as is already done by the reaper-thresher, and received into a box, but not threshed. From this box the ears could be conveyed to a corner of the field or to a barn, where, after drying, they would at leisure be put through a very simple threshing machine and handled with comparatively little labor. It may be that future improvements will tend in this direction; but whatever their ultimate direction, they will always lead to better State wheat averages if they help to remove the crop at an early date from unnecessary exposure to summer storms and winds.

Conclusion.

In conclusion, I feel that I should apologise for my address, because I know that I have not been able to concentrate into it all I intended conveying. During the last few months I have found on my hands many unexpected tasks, and it is only brief and scattered intervals that I have been able to give to the preparation of my Congress Address. Hence, it is to be feared that it has grown cold on the anvil, and has not altogether taken the shape originally intended for it. I trust, however, that it will have had the effect of making clear to you the real progress of the past decade, on the one hand, and how much still remains to be done, not only by ourselves, but by our descendants as well, on the other. We often hear it said that in South Australia new land is more or less exhausted, with the unspoken inference that stagnation lies ahead of us. Personally, I take quite other views, and believe that the sooner we exhaust available new country the better will it be for us as a farming community. It cannot be said that in the past South Australia has been farmed, in the proper meaning of the term; for the most part we are a restless, more or less nomadic community, content to skim off the virgin cream of the land, and pass on to a new selection. Practices such as these are fatal to progress, and in my view the sooner temptation, in the shape of new land, is withdrawn from us, the sooner we shall attain to a State wheat average worthy of our grit, commonsense, and intelligence.

(To be continued.)

THE AGRICULTURAL OUTLOOK.

REPORT FOR MONTH OF NOVEMBER.

The following reports on the general agricultural condition and outlook of the areas represented by the Government Experimental Farms mentioned below have been prepared by the respective managers:—

Eyre's Peninsula.—Weather—Rough weather has been predominant thoughout the month, combined with mostly cool conditions with strong west and south-west breezes, interspersed with thundery and stormy conditions from north and north-west. Over 1in. of rain has fallen, which has helped materially to improve the later wheats and oat crops. Crops.—In some cases Gluyas has been unable to withstand the weather conditions, and is laid badly. Red rust has developed rather strongly on a few of the more protected parts of crops. Early wheats are ripening irregularly, some patches being ready for the stripper, whilst others are yet soft and greenish. Natural feed is dying off, and grass seeds are plentiful. Rust has been noticed badly affecting some of the native grasses. Stock.—Horses that have been on the natural feed are fat, in fact rather too fat for fast harvesting work. Pests.—Cockatoos and parrots are congregating on the ripening wheat, and saving the harvesters some work.

Booborowie.—Weather—This month the weather has been noted for its coldness and the quantity of rain that fell, not a week passing without a good rain. Frosts have been prevalent. Several very severe thunderstorms occurred during the last week. Crops have been greatly benefited during this month by the rains, and great improvement is shown, especially in the stubble crops; the yields should be very heavy. Natural Feed—There is plenty of good natural feed, the grasses having been kept green by the late rains. Stock are in first class condition, and very free from illness. Pests—Grubs have again made their appearance in the lucerne, and are doing damage. Miscellaneous—Haymaking will be started shortly; much lucerne has been cut for hay.

Kybybolite.—Weather—The weather has been very unseasonable, the 328 points of rain registered being 174 points in excess of the average for the month. The rain has generally been accompanied by hail and strong winds. Crops are generally satisfactory, and still promise a good average yield, but on account of the cool wet conditions are somewhat late in maturing. Haycutting will not be general for at least a fortnight, and then only if summer conditions are experienced in the meantime. Oat crops that were at all rank have lodged badly, but no other crops have been affected by the rough weather. Natural feed has gone to seed; much benefit will be obtained this year from a big seeding on most pastures. Stock are improved, and their condition ranges from good to fat. Shearing has been delayed by the rains, and is not yet completed. Pests—The Rutherglen fly has again been noticed in the district. Miscellaneous—Fallowing is still possible, and is being continued by some; the cultivation of fallow is also in progress.

Turretfield.—Weather—The month of November was remarkable for its abnormal weather conditions. Instead of dry and warm weather, heavy falls of rain were experienced, the total for the month amounting to 335 points, and, in addition, the temperatures were more like those of July and August rather than November. Crops—With heavy winds and the ground more or less in a sodden condition, farmers were rather anxious concerning their crops, but although some crops have been flattened to the ground in places, the amount of damage done is not great. The last fall of 61 points, registered on the 25th, did more damage in this respect than all the others put together. Haymaking has of course been greatly interfered with, and owing to the suddenness of the downpours of rain farmers were at times unable to stook the sheaves, which were consequently at the mercy of the weather. So far there has been no sign of red rust in the wheat crops. Natural feed is still abundant, and owing to the wet and cool weather is not drying off so quickly as is usual at this time of the year. Stock are keeping

well and in good condition. Sparrows and starlings are very numerous. Owing to the cool and wet weather the cultivation of the fallow paddocks has not been so effective, as a fair proportion of the weeds is starting again when rain falls immedintely after cultivation.

Veitch.—Weather—Two hundred and four points of rain have been recorded for the month. Veitch average, 93 points. A few windy days have been experienced during the past week. Crops all look well and are making a splendid head. Some of the weak strawed varieties are inclined to go down. Natural feed good. Stock all in marketable condition. Pests—Nothing troublesome. Miscellaneous—Haymaking operations are nearing a finish, and a large quantity has been made in this district.

DAIRY AND FARM PRODUCE MARKETS.

A. W. Sandford & Co. Limited, report on 1st December:—

BUTTER.—Extremely favorable weather again ruled throughout the month of November, and this State continues to have a substantial surplus over local requirements, which is finding its way to the London market, where excellent prices continue to rule. This applies not only to factory butters, but to milled dairies, which last-named have very substantially improved in value since a month ago. Local rates for butter in prints at the close of the month, in accord with the Federal proclamation, were:—"Alfa," 1s. 4½d.; "Primus," 1s. 4d.; choice separators and dairies, 1s. 2½d. to 1s. 3½d.; store and collectors', 1s. 1d. to 1s. 1½d. per lb.

EGGS.—Substantial consignments arrived throughout the month, and on the whole, parcels came to hand in excellent condition. Values remained extremely steady until the last week in November, when prices here, in sympathy with the advanced rates in the eastern States, hardened a halfpenny. Considerable quantities were pulped, this material finding its way to the eastern States, as well as oversea. Quotations, loose, at mart, hen, 9½d.; duck, 10½d. per dozen.

CHEESE.—Record quantities have arrived from the factories, and yet prices have decidedly improved. Shipments to east and west have maintained, and rates are now 7½d. to 8½d. per lb. for large to smaller sizes.

HONEY.—Market in this line is also firmer, values now being 3½d. to 4d. per lb. for prime clear extracted. Beeswax finds ready sale at 1s. 5d. to 1s. 6d. per lb.

ALMONDS.—Odd lots have come to hand during the month, and been easily disposed of at advanced prices. Brandis, 10d.; mixed softshells, 9d.; hardshells, 5d.; kernels, 1s. 7d. per lb.

BACON.—Much heavier quantities of bacon were received during November, and rates are in consequence not quite so strong as those ruling a month earlier. Best factory-cured sides, 11d. to 1s. per lb.; hams, 1s. 1d. to 1s. 3d. per lb.

LIVE POULTRY.—Extensive catalogues of poultry have been submitted, farmers wisely sending in their surplus stocks. The trade are now operating in anticipation of Christmas requirements, and putting away in cold store, so that prices from now on are likely to be good, where quality is right. Good table roosters, 3s. 9d. to 4s. 9d.; nice conditioned cockerels, 3s. to 3s. 6d.; plump hens, 2s. 3d. to 3s. 3d., (a few coops of light sorts selling lower); ducks, 2s. 6d. to 4s. 2d.; geese, 5s. 6d. to 6s. 6d.; pigeons, 7½d. each; turkeys, from 8d. to 11d. per lb. live weight for fair to good table birds.

POTATOES.—The Adelaide market at present is being wholly supplied from the surrounding plains, where good crops are now being dug. Values have receded to the extent of £9 during the month. ONIONS.—There is no further demand for imported old ones, as supplies of local new ones are offering freely. Quotations:—Potatoes, £7 to £8 per ton of 2,240lbs. on trucks, Mile End or Port Adelaide. Onions, £6 to £7 per ton of 2,240lbs. on trucks, Mile End or Port Adelaide.

RAINFALL TABLE.

The following figures, from data supplied by the Commonwealth Meteorological Department, show the rainfall for the month of and to the end of November, 1916, also the average precipitation to the end of November, and the average annual rainfall.

Station.	For Nov., 1916.	To end Nov., 1916.	Av'ge. to end Nov	Av'ge. Annual Rainfall
FAR NORTH AND UPPER NORTH.				
Oodnadatta	0·57	8·46	4·33	4·76
Warrina	0·87	—	—	—
William Creek...	1·01	—	—	—
Coward Springs ..	0·56	—	—	—
Tarcoola	0·47	6·12	7·25	7·58
Hergott	0·33	5·65	5·39	6·04
Farina	0·96	7·27	6·11	6·70
Leigh's Creek ...	1·30	7·30	7·83	8·66
Beltana	0·81	7·86	8·43	9·22
Blinman	1·08	11·25	12·00	12·83
Hookina	1·15	17·38	—	—
Hawker	0·99	17·57	11·36	12·22
Wilson.....	1·22	17·77	11·01	11·78
Gordon	0·79	13·28	9·63	10·26
Quorn	1·15	18·77	13·17	13·78
Port Augusta....	1·15	10·55	8·95	9·46
Port Augusta W..	1·03	10·52	8·73	9·36
Bruce	1·26	12·02	9·57	10·01
Hammond	1·86	12·50	10·77	11·46
Wilmington	2·21	21·78	17·42	18·26
Willowie	1·89	14·56	11·30	11·90
Melrose	5·32	32·82	22·14	23·04
Booleroo Centre..	2·80	19·11	15·83	15·83
Port Germein ...	2·44	10·72	12·11	12·84
Wirrabara.....	4·36	28·65	18·07	18·91
Appila	2·19	17·13	14·11	15·08
Cradock	1·27	10·81	10·18	10·86
Carrieton	1·49	14·90	11·34	12·22
Johnburg	1·37	11·37	9·46	10·21
Eurelia	2·33	15·99	13·24	13·24
Orroroo	1·97	15·75	12·70	13·42
Black Rock	2·10	14·98	11·49	12·25
Petersburg	2·74	16·55	12·22	13·07
Yongala	2·72	19·21	13·04	13·94
NORTH-EAST.				
Ucolta	1·65	13·84	—	—
Nackara	0·71	10·68	—	—
Yunta	0·36	7·82	7·68	8·22
Waukaringa	0·46	9·08	7·36	7·94
Mannahill	0·42	7·87	7·83	8·46
Cockburn	0·49	9·59	7·45	7·97
Broken Hill, NSW	0·58	9·67	8·83	9·63
LOWER NORTH.				
Port Pirie	3·38	17·20	12·55	13·21
Port Broughton .	2·44	19·47	13·73	14·33
Bute	2·78	22·05	14·81	15·42
Laura	3·35	22·43	17·35	18·22
Caltowie	3·66	20·75	16·32	17·27
Jamestown	2·78	21·94	16·47	17·46
Gladstone	3·26	19·17	15·24	16·00
Crystal Brook....	3·19	20·59	14·82	15·62
Georgetown	2·38	21·58	17·42	18·32
Narridy	1·93	16·86	16·00	16·79

Station.	For Nov., 1916.	To end Nov., 1916.	Av'ge. to end Nov.	Av'ge. Annual Rainfall
LOWER NORTH—*continued.*				
Redhill	1·56	21·13	16·07	16·79
Spalding	1·85	24·71	19·36	20·25
Gulnare	1·89	22·04	19·00	19·74
BundaleerW.Wks.	1·61	22·60	16·34	17·29
Yacka	1·41	18·96	14·56	15·27
Koolunga	1·90	19·87	15·11	15·94
Snowtown.....	2·88	23·89	15·06	15·70
Brinkworth	2·02	22·60	14·78	15·48
Blyth.....	2·74	22·26	15·63	16·34
Clare	3·78	32·74	23·37	24·30
Mintaro Central...	3·74	33·97	21·08	21·99
Watervale.....	4·40	37·15	26·06	27·17
Auburn	4·86	28·62	23·27	24·25
Hoyleton	3·99	21·12	17·17	17·96
Balaklava	3·12	17·90	16·63	16·62
Port Wakefield ..	2·84	18·05	12·57	13·13
Terowie	1·62	15·18	12·72	13·71
Yarcowie	1·36	16·52	13·10	13·91
Hallett	1·45	17·17	15·50	16·40
Mount Bryan ...	2·13	24·38	15·05	15·73
Burra	2·25	24·52	16·99	17·82
Farrell's Flat	2·51	23·66	18·07	18·87
WEST OF MURRAY RANGE.				
Manoora	3·88	24·97	17·17	18·09
Saddleworth	3·64	22·22	18·80	19·68
Marrabel	4·09	29·45	18·11	18·94
Riverton	4·88	28·34	19·08	20·48
Tarlee	3·69	22·00	16·66	17·48
Stockport	3·34	23·04	15·16	15·89
Hamley Bridge ..	3·06	21·22	15·61	16·45
Kapunda	4·48	26·97	18·78	19·67
Freeling	3·59	24·27	17·03	17·85
Greenock	4·77	22·14	12·41	21·46
Truro.....	3·46	27·62	18·84	19·74
Stockwell	3·95	27·00	19·33	20·30
Nuriootpa	4·01	31·38	20·20	21·25
Angaston	4·14	31·28	21·18	22·25
Tanunda	3·16	28·34	21·31	22·28
Lyndoch	3·86	28·01	22·07	23·01
Williamstown....	3·51	—	—	—
ADELAIDE PLAINS.				
Mallala	3·14	18·38	16·10	16·88
Roseworthy	3·92	21·96	16·53	17·31
Gawler	3·92	25·32	18·37	19·21
Two Wells	2·29	18·43	15·64	15·26
Virginia.....	3·76	21·71	16·77	17·58
Smithfield	2·89	21·47	16·54	17·30
Salisbury	3·78	24·33	17·81	18·57
North Adelaide ..	2·86	30·19	20·49	21·49
Adelaide	2·84	26·49	20·10	21·04
Brighton	2·53	26·25	19·02	19·93
Glenelg	2·20	23·27	17·52	18·35
Magill	4·37	26·76	24·53	25·49

RAINFALL—*continued.*

Station.	For Nov., 1916.	To end Nov., 1916	Av'ge. to end Nov.	Av'ge. Annual Rainfall
ADELAIDE PLAINS—*continued.*				
Glen Osmond ...	3·86	32·91	24·15	25·26
Mitcham	3·66	29·93	92·52	23·47
Belair	4·38	21·54	27·52	28·64
Grange (Seaton) .	2·28	—	—	—
Unley	3·32	—	—	—
Rose Park	4·15	—	—	—
Paradise	3·54	—	—	—
MOUNT LOFTY RANGES.				
Teatree Gully....	5·32	32·94	27·01	28·19
Stirling West ...	5·00	54·16	44·88	46·70
Uraidla	5·23	53·83	42·59	44·35
Clarendon	3·65	36·28	32·26	33·67
Morphett Vale ..	3·08	26·78	22·36	23·32
Noarlunga	3·51	25·68	19·51	20 28
Willunga	3·63	30·25	25·07	25·98
Aldinga	2·72	24·04	19·47	20·34
Myponga.....	4·36	—	—	—
Millbrook Reservr.	5·04	—	—	—
Normanville	2·54	25·79	19·89	20·65
Yankalilla.....	3·26	40·95	21·91	22·78
Cape Jervis	1·72	15·99	15·71	16·34
Mount Pleasant .	2·88	33·74	25·89	26·87
Blumberg	3·08	35·36	28·26	29·38
Gumeracha	4·20	38·59	32·01	33·30
Lobethal	4·74	44·53	34·13	35·38
Woodside.....	3·58	35·15	30·73	31·87
Hahndorf	3·58	35·26	34·16	35·45
Nairne	2·94	29·46	27·78	28·83
Mount Barker ...	4·15	37·35	29·76	30·93
Echunga	4·48	38·04	31·64	32·83
Macclesfield	4·25	36·29	29·64	30·72
Meadows	6·57	47·16	34·26	35·52
Strathalbyn	2·84	22·12	18·52	19·28
MURRAY FLATS AND VALLEY.				
Wellington	2·88	17·41	14·25	15·01
Milang	3·90	16·48	15·44	16·08
Langhorne's Brdg	2·13	14·79	14·53	15·27
Tailem Bend	2·59	16·71	—	—
Murray Bridge ..	1·80	14·77	13·58	14·32
Callington	2·21	17·16	14·94	15·85
Mannum	1·33	13·76	11·14	11·67
Palmer	1·57	17·80	14·91	15·60
Sedan	0·79	15·65	11·33	11·92
Swan Reach.....	1·12	—	—	—
Blanchetown	1·01	9·43	10·06	10·71
Eudunda.....	3·72	24·52	16·44	17·33
Sutherlands	1·90	16·37	9·99	10·60
Morgan	1·87	12·06	8·57	9·29
Overland Corner .	1·23	9·94	11·42	11·42
Renmark	2·28	12·60	10·93	10·93
Loxton	1·95	15·55	—	—
WEST OF SPENCER'S GULF.				
Ceduna.....	0·67	10·89	9·74	10·13
White Well.....	0·47	11·59	9·11	9·67
Fowler's Bay	0·94	14·29	11·87	12·11
Penong	1·13	10·09	11·57	11·93
Murat Bay	0·90	14·40	—	—
Smoky Bay	0·62	14·18	—	—
Streaky Bay.....	1·01	15·88	15·31	15·31

Station.	For Nov., 1916.	To end Nov., 1916.	Av'ge. to end Nov.	Av'ge. Annual Rainfall
WEST OF SPENCER'S GULF—*continued.*				
Port Elliston	1·33	18·49	16·49	16·49
Port Lincoln	1·69	23·48	19·28	19·88
Tumby Bay	1·85	16·65	14·54	15·00
Carrow	2·20	18·66	—	—
Cowell	2·36	12·64	11·29	11·76
Point Lowly.....	2·58	13·48	15·60	12·21
Petina	0·40	..	..	—
Talia	1·10	—	—	—
Cummins	1·95	—	—	—
Arno Bay	1 26	—	—	—
Cleve	1·41	..	—	—
Hummock Hill ..	1·34	..	—	—
Port Vincent	1·38	..	—	—
YORKE'S PENINSULA.				
Wallaroo.....	1·64	18·39	13·53	14·05
Kadina	2·36	21·88	15·33	15·88
Moonta	2·63	21·77	14·62	15·22
Green's Plains ...	1·89	20·37	15·24	15·73
Maitland	3·04	30·06	19·36	20·08
Ardrossan	1·41	18·88	13·38	13·89
Port Victoria ...	1·56	21·45	14·63	15·20
Curramulka	1·03	20·64	17·90	18·51
Minlaton	2·13	25·15	16·85	17·41
Stansbury	1·95	20·90	16·51	17·06
Warooka	2·94	22·40	17·15	17·71
Yorketown	2·99	21·98	16·89	17·47
Edithburgh	2·64	21·32	15·89	16·48
SOUTH AND SOUTH-EAST.				
Cape Borda	2·68	25·80	24·33	25·09
Kingscote	2·26	22·55	18·23	18·95
Penneshaw	2·68	22·11	20·54	21·34
Cape Willoughby..	3·67	29·86	18·88	19·69
Victor Harbor ...	3·46	21·36	21·35	22·18
Port Elliot	3·41	20·45	19·56	20·33
Goolwa	3·94	21·98	17·22	17·93
Pinnaroo	3·49	20·13	15·80	16·74
Parilla	2·88	19·95	—	—
Lameroo	2·42	20·37	15·59	16·55
Parrakie	2·24	17·44	—	—
Geranium	2·69	20·45	—	—
Peake	2·80	19·95	—	—
Cooke's Plains ..	3·23	20·93	13·98	14·74
Coomandook	3·07	23·03	—	—
Kalangadoo	5·19	—	—	18·87
Meningie	2·83	22·32	18·04	17·49
Coonalpyn	2·48	21·98	16·55	16·80
Tintinara	2·48	23·30	17·61	18·78
Keith.....	2·38	21·04	—	—
Bordertown	2·89	20·97	18·62	19·76
Wolseley	2·87	20·78	16·84	17·72
Frances	2·27	19·40	19·47	20·74
Naracoorte	2·93	23·40	21·50	22·60
Penola	4·03	26·37	25·39	26·78
Lucindale	3·05	23·18	22·13	23·32
Kingston.....	2·37	24·33	23·52	24·73
Robe	2·78	29·54	23·68	24·69
Beachport.....	3·45	31·81	26·42	27·51
Millicent	4·02	34·71	28·01	29·25
Mount Gambier .	4·02	32·88	30·23	32·00
C. Nrthumberland	3·55	27·90	25·40	26·63

AGRICULTURAL BUREAU REPORTS.

INDEX TO CURRENT ISSUE AND DATES OF MEETINGS.

Branch.	Report on Page	Dates of Meetings. Dec.	Jan. 1917.
Amyton	406–17	12	—
Angaston	412	—	—
Appila-Yarrowie	*	—	—
Arden Vale & Wyacca	*	—	—
Arthurton	*	—	—
Balaklava	*	9	13
Beaufort	407	14	—
Beetaloo Valley	408	—	—
Belalie North	*	—	—
Berri	423	6	10
Blackheath	430	—	6
Blackwood	425–30	19	20
Blyth	*	9	13
Bookpurnong East	423	—	—
Booleroo Centre	408	8	—
Borrika	*	—	—
Bowhill	*	—	—
Brentwood	417	7	4
Brinkley	424	9	—
Bundaleer Springs	412	—	—
Burra	*	—	—
Bute	418	—	—
Butler	*	11	—
Caltowie	*	—	—
Canowie Belt	412	—	—
Carrieton	†	—	—
Carrow	†	14	—
Cherry Gardens	430	5	2
Clanfield	†	16	—
Clare	*	—	—
Clarendon	430	—	—
Claypan Bore	*	12	—
Colton	*	—	—
Coomandook	*	16	—
Coomooroo	*	16	—
Coonalpyn	424	15	—
Coonawarra	*	—	—
Coorabie	*	16	—
Cradock	*	16	—
Crystal Brook	412	—	—
Cummins	422	9	6
Cygnet River	†	7	4
Davenport	*	—	—
Dawson	*	—	—
Denial Bay	*	—	—
Dowlingville	*	—	—
Edillilie	*	—	—
Elbow Hill	†	16	—
Eurelia	406	—	—
Forest Range	427–31	14	—
Forster	†	16	—
Frances	†	—	—
Freeling	412	7	—
Gawler River	413	13	—
Georgetown	412	—	—
Geranium	*	30	27
Gladstone	409	16	—
Glencoe	431	11	—
Glencope	*	—	—
Goode	†	—	—
Green Patch	422	11	—
Gumeracha	427	—	—
Halidon	424	—	—
Hartley	428	6	—
Hawker	407	12	9
Hilltown	412	—	—
Hookina	407	5	2
Inman Valley	431	7	16
Ironbank	†	—	—
Julia	*	—	—
Kadina	432	9	13
Kalangadoo	428	2	6
Kanmantoo	*	—	—
Karoonda	*	—	—
Keith	*	—	—
Ki Ki	*	—	—
Kingscote	424	—	—
Kingston-on-Murray	432	5	2
Kongorong	422-3	5	2
Koonibba	422	11	—
Koppio	432	7	4
Kybybolite	*	16	—
Lameroo	*	—	—
Laura	409	—	—
Leighton	414	5	—
Lone Pine	428	16	—
Longwood	*	—	—
Loxton	433	—	—
Lucindale	†	7	—
Lyndoch	†	—	—
MacGillivray	*	2	—
Maitland	*	11	8
Mallala	*	—	—
Mangalo	424	—	—
Mantung	‡	5	2
Meadows South	*	—	—
Meningie	‡	10	—
Milang	*	12	9
Millicent	419–20	9	6
Miltalie			

INDEX TO AGRICULTURAL BUREAU REPORTS—*continued.*

Branch.	Report on Page	Dates of Meetings.	
		Dec.	Jan.
			1917.
Mindarie	*	4	—
Minlaton	419	8	5
Minnipa	*	—	—
Mintaro	409–10	9	6
Mitchell	*	—	—
Monarto South	424	—	—
Monteith	*	—	—
Moonta	418	16	—
Moorlands	†	—	—
Morchard	406	9	—
Morgan	424	—	—
Morphett Vale	†	—	—
Mount Barker	430–1	6	3
Mount Bryan	*	—	—
Mount Bryan East	†	16	—
Mount Compass	*	—	—
Mount Gambier	433–4	9	—
Mount Hope	*	15	—
Mount Pleasant	*	—	—
Mount Remarkable	*	—	—
Mundalla	435	13	10
Mundoora	*	—	—
Murray Bridge	425	9	—
Mypolonga	†	6	3
Myponga	*	—	—
Myrtle	*	—	—
McNamara Bore	*	—	—
Nantawarra	417	—	—
Naracoorte	436	9	—
Narridy	*	16	—
Narrung	*	16	—
Netherton	‡	—	—
North Booborowie	412	—	—
North Bundaleer	*	—	—
Northfield	417	5	2
Orroroo	*	16	—
Parilla	*	7	4
Parilla Well	*	—	—
Parrakie	*	2	6
Paskeville	*	—	—
Penola	*	2	—
Penong	423	9	13
Petina	*	—	—
Pine Forest	*	—	—
Pinnaroo	425	8	—
Pompoota	‡	7, 21	11, 25
Port Broughton	*	—	—
Port Elliot	‡	16	20
Port Germein	*	—	—
Port Pirie	*	9	6
Quorn	*	9	6
Ramco	425	—	—
Redhill	*	5	2
Renmark	425	—	—
Riverton	414	—	—
Roberts and Verran	421	12	—
Rosenthal	415	—	—
Rosy Pine	425	—	—
Saddleworth	416	—	—
Salisbury	416	5	—
Salt Creek	*	—	—
Sandalwood	*	—	—
Sherlock	*	—	—
Spalding	*	—	—
Stirling's Well	+	9	—
Stockport	*	—	—
Strathalbyn	431	5	2
Sutherlands	*	—	—
Tantanoola	*	2	6
Tarcowie	*	5	2
Tatiara	*	2	6
Tintinarra	*	—	—
Two Wells	*	—	—
Uraidla and Summert'n	431	4	—
Waikerie	*	15	—
Warcowie	*	16	—
Warrow	*	—	—
Watervale	*	—	—
Wepowie	*	2	6
Whyte-Yarcowie	*	—	—
Wilkawatt	*	—	—
Willowie	*	5	2
Wilmington	407	—	—
Wirrabara	†	—	—
Wirrega	*	—	—
Wollowa	*	21	—
Woodleigh	425	—	—
Woodside	*	—	—
Wynarka	425	—	—
Yabmana	*	—	—
Yacka	411	—	—
Yadnarie	421–3	—	—
Yallunda	†	—	—
Yaninee	423	—	—
Yeelanna	423	—	—
Yongala Vale	412	4	8
Yorketown	*	—	—

*No report received during the month of October. † Formal report only received.
‡ Held over until next month.

ADVISORY BOARD OF AGRICULTURE.

Date of Meeting—January 10th, 1917.

THE AGRICULTURAL BUREAU OF SOUTH AUSTRALIA.

Every producer should be a member of the Agricultural Bureau. A postcard to the Department of Agriculture will bring information as to the name and address of the secretary of the nearest Branch.

If the nearest Branch is too far from the reader's home, the opportunity occurs to form a new one. Write to the department for fuller particulars concerning the work of this institution.

REPORTS OF BUREAU MEETINGS.

UPPER-NORTH DISTRICT.

(PETERSBURG AND NORTHWARD.)

MORCHARD (Average annual rainfall, 11in. to 12in.).

October 9th.—Present: 17 members and one visitor.

CARE AND FEEDING OF WORKING HORSES.—A paper on this subject was read by Mr. S. Twigden, who said that if horses were kept in a small paddock adjoining the stables they would require less attention than if enclosed in a stable. Hay should be slightly on the green side, and a mixture of wheat and white oats was preferable. Every master should see that each horse received its proper share of feed, that it was fed at regular hours with a properly balanced ration, and given time to finish its feed. Horses should have regular hours of work, and eight hours of general farm work was sufficient. Every horse should have a collar of its own. Changing collars from horse to horse every day was a sure method of producing sore shoulders. Unevenness of length of chains very often resulted in sore shoulders. The animals should be groomed every morning. Mr. H. Brown considered that hay should not be too green and should have plenty of grain in it. Mr. H. A. Tilbrook said that horses should not work more than four hours without something to eat. Mr. W. Toop preferred wheat and oaten hay mixed and cut somewhat green. Horses should always be watered before meals. Mr. E. J. Kitto said that damped feed was very beneficial in summer and autumn. Wattle bark lotion was good for tender shoulders. Mr. R. Jasper said that a horse should not be given more to eat than it could clean up. Mr. Scriven said that slow eaters should always be allowed time to eat their feed.

THE PRIVILEGES OF THE BUREAU.—Mr. J. W. Reichstein read a paper on the privileges of the Bureau, in which he said that the object of the Bureau was the improvement of the agricultural industry by the dissemination of practical information and scientific knowledge. The Bureau enabled the scientific officers of the Department to educate the farmers in the latest methods in the raising and treatment of produce. Members of the Bureau should be regular attendants at the meetings, and take a fair share of the work. They should make it their duty to bring under the attention of other members any matters of practical interest connected with agriculture which they might notice, and should give freely of their experience for the benefit of their fellows. Mr. W. Toop said that if farmers took more interest in the Bureau, much more would be learned. Mr. Kitto said that the Agricultural Bureau had greatly influenced a better class of farming in South Australia.

AMYTON, October 17th.—A paper was read by Mr. H. C. Pitchers dealing with farming on scientific lines. He traced the growth of modern methods of farming and showed the necessity for them. In the course of discussion, Mr. H. K. Gum said that he favored shallow fallowing and feeding off with sheep. Mr. Foulis expressed the opinion that it was possible to spoil a crop with too much manure. Mr. W. Gum said that rain was the best fertiliser, but considered that some manure should be used. Mr. Donohue said that manure improved green land, but fallow did not require it so much.

EURELIA, November 25th.—The initial meeting of the Branch was well attended. A paper was read on breakages in binders, by Mr. C. A. Kaerger, in which he pointed out that the parts which most frequently broke in binders were the fans. It was a great improvement to thread No. 14 binding wire about 2in. from

the ends of fans (in heavy crops at both ends) in order to make a complete circle. That held the fans more firmly and prevented them giving way. Another improvement was to fix a prop to the pole, which would keep the weight off the horses' necks when the machine was stopped. It could be so arranged to be unstrapped when needed.

HAWKER, September 19th.—Mr. J. Smith read a paper on the cheapest method of harvesting wheat crops in that district, contending that the combined harvester provided the most useful and the cheapest method of garnering the crop. Members, in discussion, agreed with the views of the writer of the paper, if the farmer were sure of harvesting 8bush. to the acre.

October 18th.—Mr. B. Mansom read a paper dealing with bookkeeping on the farm, in which he urged the many advantages to be derived in farming from the maintenance of a proper set of books.

HOOKINA, October 10th.—Mr. B. Murphy read a paper on haymaking, in which he advocated cutting plenty of hay, when the opportunity occurred in that district, where dry seasons were experienced every few years. Wheat should be cut before the grain was more than three parts full sized, because the straw was much sweeter and all the flag was saved. If left until later, waste occurred in the grain in carting and stacking, and mice and birds did considerable damage. Parts of the crop dirty with wild oats should be cut away, because if allowed to ripen the seeds would be blown over the ground and a very dirty crop would be reaped the following year. It was a great saving of labor to cut hay with a binder, because sheaved hay could be carted when it was too windy to cart loose hay. Members generally concurred in the views expressed.

WILMINGTON, October 11th.—Mr. Farrell read a paper entitled, "Will Bulk Handling of Wheat Benefit the Farmer?" and it excited considerable discussion.

MIDDLE-NORTH DISTRICT.

(PETERSBURG TO FARRELL'S FLAT.)

BEAUFORT.

October 5th.—Present: six members and one visitor.

SIDE LINES ON THE FARM.—In a paper dealing with side lines on a farm, Mr. G. Underwood drew attention first of all to sheep, without which, he said, the farm was not complete. The Merino, free of wrinkles and without much grease in the wool, was the breed preferred. The rams could be allowed to run with the ewes all the year round. Ewes could be saved for breeding and wethers used for mutton. Three or four cows, preferably of the Shorthorn breed, should be kept. These should be purchased just when coming into milk, kept as long as possible, and then fattened and sold. Pigs could be fed on slops from the house, skim milk, and waste corn. They should be given the run of an acre or so, wire netted and enclosing a straw stack. The Mid York was the best breed. Poultry, and a few Guinea fowls should be allowed the run of the place, and geese kept apart from the fowls and carefully attended, had their place on the farm. Mr. Mugford agreed that sheep came first, as they provided meat and wool and also kept the fallow clean. They paid the best. Cows also paid well, especially of late, because dairy produce had been a good price. Pigs were also profitable and it was a good idea to have a straw stack instead of a sty, because it would keep the pigs warm and clean. Poultry were good and not much trouble. Mr. W. B. Sampson said if sheep were kept the tendency would be to spare the feed and leave the fallowing until it was too late and loss would be incurred in that way. He thought fowls paid the best. All that had to be done was to throw them a bit of wheat and then let them scratch for the rest. Mr. J. Sampson said sheep were the most profitable. As long as the fences were strong, they would look after themselves. He was averse to leaving the rams with the ewes all the year round. Lincolns and Shrops. were the best for mutton, but they required better fences than the Merino, which was the best for wool. The more wrinkles the more wool. Cows were too much of a tie and made too much work. The Yorkshire pigs were becoming favorites, but he

thought they got too fat. Poultry were very profitable and not much trouble. Mr. C. Wilson found that Guinea fowls would not keep the foxes away. He also liked the Mid York pigs.

BEETALOO VALLEY (Average annual rainfall, 18in. to 19in.).

October 9th.—Present: 10 members and three visitors.

HANDLING YOUNG HORSES.—Mr. A. Clogg read a paper on the handling of young horses, in which he recommended driving the animal into a small yard, putting a rope on its neck, and tying it up to a post. It would do the horse no harm to have a good pull, and then it should be rubbed gently with the hand, or, if it were very wild, with a stick until the animal realised that it was not to be hurt. Then a halter should be put on. There might be some difficulty about that operation, and it was well to have a spring hook at the bit which should be undone and the halter then slipped over the ears. A point should be made of always treating the animal kindly. When the colt had been caught a rein should be attached to the bit, and the animal made to run in a circle, first on one side and then on the other. If very hard to hold, the rein should be slipped through the bit rings under the jaws, and one man could then very easily hold it. When put to work, it should be in a well-fitting collar, and the horse should not be worked too long. When returning to the yard before being turned out, the animal should have its shoulders washed with cold water and salt. If not in a tandem team, the colt should be driven with reins and made to draw a log before being driven with a breast team, in order to accustom it to the collar. To make the colt start with the others, it should be touched lightly with a stick and called by name. Mr. Cox preferred an old collar for a young horse, and put the young horse in the body of a wagon after handling. Mr. Bartrum recommended teaching foals to be accustomed to be tied up.

GARDENING IN BEETALOO VALLEY.—Premising that Beetaloo Valley was an ideal spot for gardening, Mr. A. H. Jacobi, in a paper dealing with gardening in that area, said it was well sheltered on the eastern and western sides by high rows of hills, which formed natural windbreaks, and provided an underground soakage to the alluvial flats where oranges, lemons, and vines did well and yielded heavy crops of good quality. Those alluvial flats were not suitable for growing crops of wheat, but with a fair amount of stable manure, they could not be excelled for producing root crops, which could be grown between the other trees. The bird pest was against growing vines, which could not be made profitable until a check was put on the birds. The eastern slopes could be planted with almost any kind of fruit trees, the only ones unprofitable in his experience being walnut and cherry trees. The past summer's experience showed that a wind break was required on the north side of gardens, as that portion of the garden had suffered somewhat from hot winds. Therefore he recommended planting a double row of almond trees. They required no looking after, and very often gave a profitable return. Olives might answer the same purpose. It would be well to experiment with a few trees before planting largely. Mr. Burton agreed that cherry growing was not suitable in that district but certain kinds of walnuts might do. Citrus fruits were most profitable, and vegetables also. They would soon pay for an irrigation plant.

BOOLEROO CENTRE (Average annual rainfall, 15.83in.).

November 10th.—Present: five members and one visitor.

TREE PLANTING.—Trees not only benefited stock and human beings, observed Mr. E. J. Nottle, in a paper on tree planting, but also improved the appearance of property. Trees were also valuable for their timber, and as the forests of the world were diminishing rapidly, it was important that they should be planted promptly to secure the future timber supply. The demand was continuous and increasing. In that district tree planting would minimise the devastation of the hot drying north winds, which took the moisture out of the soil. He recommended the Kurrajong, which grew to a height of 30ft., and not only afforded extensive shade, but provided good feed for stock. In Spain, areas which had been denuded of timber for the production of charcoal were ravaged by the winds, which, taking the moisture out of the soil, transformed the land into sandy wastes. Experiments had demonstrated that in forest lands 25 per cent. more rain was registered than on open land. Mr. W. H. Nottle, sen., referred to the usefulness of trees, which he had planted as shelters for sheep and their beautifying effect upon the landscape. Mr. W. G. Whibley also endorsed the views of the writer of the paper, and commented on the value of trees as windbreaks and for sheltering stock.

GLADSTONE (Average annual rainfall, 16in.).

October 7th.—Present: 18 members.

PIGS ON THE FARM.—Pigs should be on every farm, observed Mr. A. B. Blesing, in a paper on that subject, whether bred on the farm or purchased as weaners to fatten. The farmer who bred his own pigs secured the breeder's profits, which, under present conditions, meant a very good return. As to the breed of pigs, for bacon he preferred the Berkshire and Yorkshire cross or even the Berkshire and Tamworth cross, which produced a good bacon pig, something that would grow and not get too fat. If farmers took more care than was usual over wheat cleaning, and the rubbish, such as screenings, white heads, &c., were fed to the pigs and turned into pork or bacon, profit could be made, and a better sample of wheat sent to market. Pigs, if fed in a proper manner, did not require a great amount of food to make them grow. If bought early in the year—from July to October—and one had a cow or two, the skim milk through the spring, with a little green feed, would keep them in good growing condition. Better still would be a small pig-proof paddock sown with barley. With plenty of exercise pigs grew better than when shut up in a small sty, and there was not nearly so much work looking after them, especially if the water was laid on. Pigs, if fed in that way and kept in a fair growing condition, should produce a carcass weighing from 200lbs. to 250lbs. at 12 months old. They should not be kept more than 12 months, except for breeding, as young pork was always preferable to pork from old pigs. Curing the older animal was more risky than the smaller or younger one. Every farmer should know how to cure his own bacon and hams. It was simple enough, and did not involve a great amount of time. In reply to questions, Mr. Blesing said that the following mixture had proved excellent for curing bacon:—For rubbing into the meat—64lbs. salt, 4lbs. brown sugar, ½lb. saltpetre; for the brine—enough salt should be used to make the liquid sufficiently strong for an egg to float in. The water should be boiled before the salt was mixed with it. The meat should be left in the brine about three weeks. An elaborate smoking house was not essential, one made of bags answering the purpose very well. In the discussion which ensued it was considered that pigs should be castrated when a week old.

LEIGHTON (Average annual rainfall, 16in. to 17in.).

October 5th.—A small attendance.

BREAKING THE FARM COLT.—Mr. R. Flower read a paper entitled "Breaking the Farm Colt," in the course of which he urged that it was necessary to get the colt in a secure yard with one or two aged horses and put a rope on him by means of a lassoo or a crush pen. The next step was to put the halter and winkers on. A good scheme was to work the winkers gradually along the top of the neck until in position, leaving the bit to be put in last. To teach the colt to lead quickly practically without the aid of a whip, a rope should be passed up through the bit ring over the head and down the other side the same, and the rope tied together at the bottom. Then, with a sharp pull to either side and motioning and speaking an appropriate word or two, the colt would soon follow without the sharp pulls. The animal should then be attached to a log and taught to pull. It was strongly advisable to handle and educate the beast thoroughly before it was placed in the team. A good deal could be taught in a few hours, but firmness and tenderness were necessary.

MINTARO.

September 19th.—Present: 36 members and visitors.

HOMESTEAD MEETING.—The meeting was held at "Hillandale," the property of Mr. C. J. H. Wright (Vice-President). A general inspection of the farm took place, and particular interest centred in the wheat, barley, and oat stud plots, which had been carried on for several years. Various imported and local varieties were under test. A sprinkling plant, covering an area of about 50ft. x 25ft. at each shift, was worked by a 2-h.p. petrol engine, distributing the water direct from a well. Fruit and vegetables and plantations of sugar gums, other eucalypts and pines were favorably commented on. The visitors were entertained at tea, after which an address dealing with the chemistry of the farm and garden was delivered by Mr. Wright. He dealt at length with the general chemical principles underlying the life, growth, nourishment and protection of plants. The changes

taking place at the germination of the seed were explained, and the various properties essential to growth were detailed. The power of roots to absorb food in solution was dealt with, and chemical factors which operated in connection with the time for cutting hay, the practice of fallowing, &c., were discussed. The properties and functions of humus were explained, and the importance of lime as a soil amendment emphasised. The composition of different classes of soils, and their physical properties were considered, as well as means for effecting their improvement. Mr. Wright spoke of his two years' experience with high-grade superphosphate (45-47 per cent.) which he recommended. He pointed out the wisdom of instituting a search for potash deposits in Australia, and the need for a classification and analysis of soils.

MINTARO.

November 4th.—Present: 21 members.

HAYMAKING.—The first thing in growing wheat for hay, remarked Mr. James Thomas, in a paper on haymaking, was to determine what kind of wheat to grow. He preferred King's Early, Marshall's No. 3, and Bluey. The first named came to maturity early in the season, and so allowed the farmer to finish haymaking before commencing harvesting. The only disadvantage was that it had a tendency to go down, when left for grain. Marshall's No. 3 was a good all-round wheat, suitable for either hay or grain. Bluey was a late wheat, suitable for a chaff merchant, but rather too late to grow on an average farm, where the farmer was anxious to get his hay in before he started reaping. The best time to cut the hay was when the grain was in the doughy stage. The size of sheaves should be about 30in. in circumference at the band. After cutting and tying, the hay should be left for a day, and then put into round stooks of about 25 or 30 sheaves, with heads upward. The time to cart the hay could be determined by taking one of the centre sheaves from the stook, pulling therefrom a straw, and breaking it at the first joint. If it broke clean it was time to start carting. That usually occurred, if the weather was hot, about 10 or 12 days after cutting. The stack, in hilly country, should be built up and down the slope, because the water that fell from the roof of the stack would then run away from both sides. For dunnage he preferred logs of wood with a covering of straw. A stack of about 50 tons should be built 6yds. wide by 15yds. long, with an 18ft. wall, and about 9ft. from the eaves to the top. In building the stack, he preferred square corners, because it was easy to keep the corners from getting low. In commencing to build, the first row of sheaves should be laid butts out, and the second row with the heads out, the heads touching the bands of the first row, and the third row with the heads touching the bands of the second row, and so on, until the middle of the stack was reached. As the stack grew higher with each load thrown on, the height of the centre should be increased by adding a few extra layers of sheaves. By keeping the stack well filled in the centre it leaned outwards on the sides, and water which fell from the roof did not run down the sides. On reaching the height of 18ft., the centre should be filled before the roof was put on. Commencing the roof, he would lay one row of sheaves (butts out) about 6in. out all the way round except the ends, which would not be drawn in at all, but left as a gable. In placing the next layer the sheaves should be with heads out, well over the previous layer, and be backed up with another layer, so that the outside and the second row were butt to butt. That caused the butt of the next outside upper row to keep high, and so cause rain, should it fall before the stack was thatched, to run outwards. The laying of the outside layer heads out should be continued, only drawn in a few inches each time, with the second layer butts against the first layer, and the third row, heads out, covering the second layer, and so on, till the top of the stack was reached, when there would be a top to the stack that would keep out the rain without thatch. For thatching the stack, he preferred sheaved straw. His method was to first put wires over the stack with the weights attached, placing them about 5ft. apart. Then a row of sheaved straw (butts out) should be placed on the eaves, with a stick in the sheaf in order to prevent it from wrigging out with the wind. A string should then be drawn from one wire to the other, lifting the wire at the same time and tying it tightly. For the next upper row the sheaf heads should be placed out, the butt of the sheaf being pulled out slightly, and the string then drawn across again and tied. This process should be repeated until the top of the stack was reached, and then the other side should

be done.—Mr. C. J. H. Wright considered King's White was the best wheat for hay, and the bearded head did not hurt the horses. He agreed with the suggestions in regard to stooking, and said that the time to stook was governed by the weather and the kind of land from which the hay was cut. On red land, it could be stooked straight after the binder, but on black land it should be left a day or two. Mr. Kelly preferred White Tuscan or Crossbred 53, but Algerian oats and a late wheat sown together for hay were best. He was averse to stooking on the flat, because the lower sheaves were always damaged. The best way to stook was to place the first sheaf so that it would stand alone, and the others should be grouped around, but so that they did not lean too much against the first sheaf. He preferred hand stooking to using the fork, because the sheaves could be put in the stook in better shape. He favored round corners to a stack, because square ones were difficult to keep straight. Mr. S. Garrard had not obtained very good results from Zealand Blue. If hay had to be left in the paddock long, it was well to make large, well-constructed stooks, with the sheaves upright, and then there would be no danger of damage from rain, and it kept a better color. No hay that was not properly dry should be put in the bottom of the stack. He preferred building the stack near the cutter, and then, with a shed over the cutter, in which the hay could be thrown, he could cut chaff on wet days. Mr. John Thomas preferred King's Early, grown with a late wheat, which gave some grain and a good color. He had grown Indian Runner 7ft. 6in. in height. It made good chaff and the horses liked it, but it caused teeth difficulties.

YACKA.

October 16th.—Present: 11 members.

POULTRY FARMING.—A paper was read by Mr. W. T. Tilbrook on poultry farming, in which he said that looked after properly, fowls would pay, but if neglected or badly cared for they would never be a source of profit. To make poultry farming pure and simple profitable it required to be carried out on a large scale. That required money, a complete knowledge of the business in all its branches, and a capacity for hard work. On a farm poultry gave good profit when the matter was carefully studied, because a great deal of material which otherwise might go to waste could be used. Undoubtedly in that way profit could be made from keeping fowls in lots of 20 to 100 as opposed to poultry farming on a large scale. Fowls should be given clean water every day in vessels placed 2in. or 3in. off the ground, in order that the hens should not fill the receptacle with litter. All water should be kept in the shade. Young chickens should be fed on moistened bran and pollard, cracked wheat, or oats until three or four weeks old. Green feed chopped up very fine should be given two or three times a week. Two sizes of chickens should not be run together, because the small ones would not get enough to eat, and would be trampled on. As soon as the roosters could be distinguished they should be separated from the pullets. Weaklings should be killed off. On account of their variety the table scraps were about the best egg-producing food. They should be thrown into a pot, covered with water, and boiled. A little bran should be added to the mixture, and when cooled given to the fowls. Stale or sour scraps should not be given to the birds. It was bad policy to stint the food of the fowls. Stock birds should be good specimens of the breed, fully developed, and not less than 12 months old. Hens should be watched when moulting time arrived. A hen that always kept a rosy comb and shed a few feathers at a time had a good strong constitution. If hens were a long time moulting they should be caught and all the old long wing and tail feathers pulled out. It would be found that they would then quickly feather up. They should also have meat two or three times a week, for meat assisted in the production of new feathers. Hens should be set on the ground, and about three days before the eggs hatched insectibane should be sprinkled around the nest and on the hen. The old nest should be taken out and fresh straw supplied. Hens should not be set on chaff. The chickens should be left until about 48 hours old, and then moved to a fresh place and put on the ground. It was a good plan to provide a small yard enclosed with fine wire netting, that the chickens could not get through, and then the hen could protect them. The ground should be soft, and there should be plenty of scratching litter for the chickens to run on, or they would be troubled with scaly legs or corns.

BUNDALEER SPRINGS, October 9th.—The paper contributed to congress by Mr. G. Hill, of Georgetown, entitled "Care of the Farm Mare," was read and discussed.

CANOWIE BELT, November 11th.—The meeting of the Branch took the form of a visit to the Government Experimental Farm at Booborowie, which proved interesting and instructive.

CRYSTAL BROOK, October 21st.—Mr. A. E. Clarke read a paper entitled, "Should Political Subjects be Discussed at Bureau Meetings?" and arrived at the conclusion that they should not. An animated discussion took place, in which the opinion was almost unanimous that political questions should be excluded from Bureau discussions.

GEORGETOWN, October 11th.—Mr. M. J. McAuley read a paper describing operations performed by Mr. F. E. Place, the Government Veterinary Expert, during his visit to Georgetown in June last.

HILL TOWN, September 29th.—Mr. C. Kostera read a paper on colt breaking on the farm, which was freely discussed, members generally endorsing the views expressed in the paper.

NORTH BOOBOROWIE, November 13th.—Mr. S. E. Mudge delivered a short address on harvesting barley. He advised reaping at once, when the barley was ripe, with a wide-combed dampweather stripper. It was necessary to tread out the heads before winnowing, and he recommended, where possible, the use of the binder and thresher in preference to the stripper and winnower. Mr. W. H. Richards said that a wide-combed highly-geared damp weather stripper with the beaters set close to the comb, would, if the horses were driven quickly, thresh out the heads sufficiently to obviate the necessity for tramping out the heads before winnowing, to obtain a clean sample. Mr. Mayfield and Mr. Hannaford respectively delivered short addresses on cutting lucerne with the binder and with the mower. In the discussion which ensued the consensus of opinion was in favor of the mower.

YONGALA VALE, October 14th.—Mr. T. H. Battersby read a paper on the relative merits of heading and harvesting wheat, and arrived at a conclusion in favor of harvesting.

LOWER-NORTH DISTRICT.

(ADELAIDE TO FARRELL'S FLAT.)

ANGASTON (Average annual rainfall, 22.25in.).

November 3rd.—Present: 17 members and three visitors.

GYPSUM.—Dealing with the value of gypsum, Mr. G. Sharp, in a paper, referred to the marked benefits which had resulted from its application to land at Renmark. Its mechanical action, he said, was to break down and open up heavy soils, whilst loose, sandy soils were bound together, and acquired body and the capacity to resist their natural tendency to drift He then quoted at length various opinions and testimonies to the value of that manure, mentioning that it was important to remember that the gypsum should not be ploughed under, but should be spread on the ploughed land, and afterwards drilled or cultivated in. As a deodoriser, he said, gypsum was one of the finest substances known, and a quantity in a box should be kept handy to every manure heap, and a few handfuls being scattered over the stalls and manure heaps every day. That would have the effect of fixing for plant use the carbonate of ammonia, which was so frequently lost. The recommendation that heavy, argillaceous soils should be dressed with gypsum to transform the large store of carbonate in the soil into carbonate of potash, and thus make potassic manures unnecessary, was of great importance at the present time, when potash was so difficult to procure.

FREELING (Average annual rainfall, 17.85in.).

September 7th.—Present: seven members and seven visitors.

HORSES STILL IN DEMAND.—Under this title, Mr. E. Morris read a paper, in which he said that Australia possessed the climatic conditions and the country for

breeding horses, and all that was necessary was to stick to the correct stamp of horse. There was, however, much to be done, and room for still greater improvement, before this country became nearly so far advanced as other countries. It was indisputable that horse breeding cost money. The French Government about three years ago distributed £340,000 in prizes at horse shows and otherwise in fostering the horse-breeding industry, and bounties were given to the owners of approved stallions standing for service at moderate prices. In addition to that, the Government maintained over 3,400 well-bred stallions of its own. Fabulous figures had been given for stallions by the United States, the Argentine Republic, and Austria. There was food for reflection. It seemed improbable that the horse was going to die out just yet. Therefore they should not neglect the establishment of an industry so tempting in its possibilities. It was an absolute certainty that there would always be a market for high-class horses, and it would be profitable to watch the export market in the future in that direction.—Considerable discussion ensued.

GAWLER RIVER (Average annual rainfall, 17in. to 18in.).

October 11th.—Present: nine members.

BINDERS.—In a paper on this subject, Mr. E. Winckel said that a farmer when buying a binder should purchase a machine from a firm who could be relied upon to ensure that an ample stock of extras was handled by the local agent. There was a great difference in the prices at which similar extras were sold by the various vendors of machines, and farmers should post themselves carefully in those details and purchase a machine which would not cause them an unreasonable amount of expense for repairs as it became old. The object of the main frame on all binders was to provide ample strength, with a minimum of weight, to ensure that the machine would be kept in perfect alignment, even though working amongst stumps and stones of rough country. If the frame were so weak as to permit the perfect alignment of any part of the machine to become deranged, it would create undue friction, which would add materially to the draught. Elevators should be designed to handle both light and heavy crops and not cause an undue strain on the canvases. In some machines the upper elevator floated from three corners only, but in others they floated from all four corners. The machines which floated from all four corners were undoubtedly the better, because every time the elevator rose in the three-corner float machine it threw the elevator with a twist, which at times caused the canvases to catch on one of the corners. The reel was a point which was generally overlooked by the farmer, not only when purchasing a machine, but also when at work. Conditions of crops in different paddocks and sometimes in one paddock varied so much that the reel should be worked far more than was generally done. In most binders the reel had a wide range of adjustment, and that should be taken advantage of where tangled and uneven crops had to be harvested. The reel should not be allowed to sag, because it was impossible to do good work unless it was kept in a horizontal position. The main chain, made of malleable links and steel pins, was far before the slip link chain, and was much longer lived. Though more expensive at first, it was cheaper in the long run, not only intrinsically, but as soon as a chain became the least fraction too long, the sprockets would begin to suffer. Therefore it was advisable to renew chains and sprocket wheels simultaneously, because new chains would not work well on worn sprockets. There was a great difference of opinion as to the weights of various binders, probably occasioned by the difference in draught. Farmers generally considered that the heaviest machine to pull was the heaviest machine in weight. That, however, was not necessarily so, because practically all the standard binders on the market weighed about the same. In fact, it was doubtful whether there was 56lbs. difference between them. The variation in draught was created solely by diversity in design of rubber and ball bearing, &c. Much depended upon the compression of binders as to whether they would tie the bundles tightly enough to satisfy the farmers. There was, however, one point about tying tightly which deserved a certain amount of attention, and that was the general wear on the machines. The more tightly a sheaf was tied the more quickly the machine was going to wear by reason of the increased strain induced by compressing. There appeared to be a wide difference of opinion as to which was the best butter for binders. Some preferred the kicking wood butter, others the rotary butter with the leather belt. Those who preferred the wood butter, claimed that the draught

on the machine was lighter, that the cost for repair parts was less, that it would make a much better sheaf, both in exceptionally heavy crops and really light ones, and that in ordinary crops very little difference could be noted between the two butters. The driving bar or pitman should be kept tight fitting, because that and sharp knives made a binder run much more smoothly than worn and blunt ones. Care should be taken to make a cut as low as possible without cutting earth, and for that reason it was essential to roll all land intended for hay, because a few cwt. per acre could very easily be lost when the binder had to be kept 2in. or 3in. higher. It was possible in some well worked even paddocks to cut the stubble down to 1in. or very little longer. He had seen stubble 3in. and 4in. in length where crops were standing quite upright. A great many farmers abuse the sheaf-carrier on a binder. Practically on all binders sheaf-carriers were constructed to carry only three or four bundles, and if that were strictly adhered to little trouble, if any, would be experienced with it. Discussion ensued on the sharpening of knives, double set of fingers on the comb, and the leading points on various machines.

LONE PINE.

October 16th.—Present: 18 members and eight visitors.

POULTRY FARMING.—In making a start in poultry farming, it was essential to commence with pure breeds, and the best at that, said Mr. A. Hoklas in a paper on poultry farming. There was no best breed for all purposes, therefore it was necessary to carefully consider the selection of a breed, and when once the selection had been made, to stick to it. Failure could nearly always be traced to the owner rather than the breed he kept. White Leghorns were the most satisfactory for egg laying, producing good sized marketable eggs at a profit. They were small eaters and good doers, and were bound to give satisfaction wherever kept.. He strongly advised a cross between a White Leghorn cock and Silver Wyandotte hen, but both of them should be pure bred. It was advisable, however, never to go beyond a first cross. The rooster should be at least one year old and the hen two years old before being bred from. The cock should be active and vigorous and a constant crower. Breeding hens should have plenty of exercise and, for that purpose the feeding ground should be well covered with cocky chaff or straw and the grain thrown into it. If hens had not sufficient scratching exercise there was a tendency to get too fat, with the result that the eggs would be deficient in yolk and therefore would not contain enough food for the chicken to live on until hatched. Every breeder should have at least a small incubator, which would enable him to hatch chickens early in the season, when broody hens were mostly very scarce; these chickens would then commence laying when eggs were generally high in price. In feeding, cleanliness was essential. All food should be placed on boards or in troughs and not thrown on the ground. A plentiful supply of greenstuff was absolutely necessary. Laying hens should have a warm mash in the morning and grain in the evening, with a liberal supply of greenfeed in the middle of the day. It was also essential to give fowls clean fresh water daily, because most diseases were caused by drinking impure water. Fowl houses should be well ventilated and roomy, and the droppings should be removed twice a week.

RIVERTON.

October 14.—Present: 18 members and five visitors.

STRIPPERS AND HARVESTERS.—Both strippers and harvesters, declared Mr. E. A. Gray, in a paper dealing with the relative merits of those machines, had staunch advocates, and it was a highly debatable point which was the more profitable. The combined harvester, as its name indicated, practically completed, in one operation, all the work of gathering the grain ready for market. In that way it had an outstanding advantage over the stripper in labor saving, and for that reason, in present scarcity of labor, had many advocates. The defects in a modern complete harvesters were that every machine, however good it was or however competent the driver, lost a certain amount of grain. A harvester or stripper would not take large foreign plants, such as wild turnip, cabbage, &c., and that caused much stoppage and waste of time. Perhaps the greatest defect was in the fact that all rubbish seeds were redistributed, much to the detriment of the succeeding crop. It was impossible to reap in damp weather. Another point, however, which did not directly affect the farmer was the uneven sample of wheat which was sometimes sent to the market. It was impossible to secure a good even sample on hilly ground. A good sample would be obtained down the middle of the bag, but, around

the sides, chaff, &c., would often be found. That must have an effect on the sample of wheat the State produced. The great advantage of the harvester was that it was a labor-saver, and that had outweighed all its defects. Most of those defects applied to the ordinary stripper, but the stripper presented the advantage that a more even marketable sample was secured, as any green grains ripened in the heap; but more time was lost in emptying the machine. The advantage of the reaper-thresher was that there was no trouble with chokes, because the heads were cut off with a knife and conveyed by means of a canvas apron to the threshing drum. He had not had any experience with those machines, but their great drawbacks were the amount of strength required to work them and the strain on the machinery when starting. Heading and threshing was a system of harvesting which he judged to be superior to any mentioned. The advantages were:—(1) Harvesting could be commenced 10 to 12 days earlier than with the harvester, because the grain would ripen in the sheaf, and an even sample of good color was produced; (2) the straw was more palatable to stock than stripped straw. It had a better feeding value, since it was much greener in color; (3) it cleaned the land of rubbish, such as cabbage, charlock, turnip, &c.; (4) the risk of damage to crops by storms was diminished; and (5) all the grain was secured. He preferred the thresher to the header. Under the header system it was impossible to know how much grain was left in the sheaves. In some sheaves there was as much grain at the hand as anywhere. Necessarily there was considerable waste at times. In regard to cutting the crop for threshing, there were two points to be considered, viz., whether it was required to conserve straw, in which case it was necessary to cut close to the ground; but if for grain chiefly, the cut could be made from 6in. to a foot from the ground, according to the crop, which could be regulated by the man on the binder. The lower cut made a great deal of difference in the output of a day's work, in connection with the length of straw. The chaff and cavings from the straw were a valuable asset, because the stock would eat it readily and do well on it. A threshing plant to do about 450bush. to 500bush. per day would require from 10 men to 12 men, that was if carted in from the field; but if stacked it could be done with two to four men less. When stacked the work would be got through more quickly, and there would be no loss of time between loads or on account of dull weather.

ROSENTHAL.

October 11th.—Present: 32 members and four visitors.

BROADCAST AND DRILLING.—Commencing with the premise that there were conditions under which broadcast would give better results than the drill, especially for hay, Mr. T. H. Arnold, in a paper entitled "Broadcast and Drilling," remarked that when land was fallowed late or not fallowed at all, drilling was, without doubt, the better way, since by placing the manure and seed together, the grain obtained all the available forcing tendencies which the manure was capable of giving, and was thereby helped to get ahead of, and eventually master, the weeds. He drilled about 20 acres right through the middle of a paddock. On either side the manure had been put in beforehand, and the whole of the section was seeded in less than a fortnight. He then commenced at one side of the paddock broadcasting the seed, and when he came to the piece that had not been manured, he drilled it with seed and manure, and then finished broadcasting the remaining piece. The whole section was seeded with the one variety of wheat (White Tuscan) and was eventually all cut for hay. The drilled portion came up a trifle more thickly than the broadcasted part, and during the winter months forged slightly ahead, but towards the end of September the broadcasted pieces caught up, and at harvest time were from 6in. to 8in. higher and very much thicker than the drilled piece, which thinned out considerably with black rust. No rust appeared in the rest of the paddock. A few of the advantages of broadcasting were that the manure could be drilled into the land towards the end of summer, usually in March, when both land and manure were thoroughly dry. A start should be made sufficiently early in order that if any wet or very windy days were encountered, the work could be left. Then when seed time arrived, if the land were fallowed and in thorough order, the actual seeding could be accomplished very quickly. Experience had shown that the first half of the crop, put in while the weeds were small with a medium weight set of chisel harrows, yielded in nine seasons out of ten, a much heavier hay crop than the latter sown half. It should be clearly understood that he did not advocate

broadcasting for grain. It might or might not be as conducive to big grain yields as drilling, but if the land were in thorough order, he claimed that, for hay purposes, it was the better way. By first drilling in the manure during the dry weather and then broadcasting the seed when the time arrived, there was much less labor involved just at a time when it was expedient to get over as much ground in as short a time as possible. The only method to secure as thick a crop with the drill, without crowding in the rows, was to cross drill once each way, which meant more labor still. There was in favor of broadcasting, the fact that the heaviest hay crop grown in the Roseworthy district, in his experience, was broadcasted and covered in with the common harrows. That was a 62 acre section sown with Dart's Imperial, which averaged 4 tons 6cwts. per acre.

SADDLEWORTH (Average annual rainfall, 19.69in.).

October 7th.—Present: eight members.

GROWING, STACKING, AND PRESERVING HAY.—With hay, remarked Mr. W. Crawford in a paper on growing, stacking, and preserving hay, it paid to cut the best. The most profitable hay wheats were White Tuscan, Field Marshall, Baroota Wonder, Bluey, Kings, and Zealand Blue. He was not keen on bearded wheats, however, as he had seen a horse's jaw in bad condition from eating beardy chaff. Zealand Blue was a wheat fast coming into favor as a hay wheat. It mattered not how long or coarse it grew, if fed long or otherwise, horses would eat every particle of it. Baroota Wonder was not liked, nor did Yandilla King make a good hay. Federation quality was good, but it did not cut such a good looking chaff. Old Bluey cut into excellent chaff, but was late and liable to rust. Early varieties were too brittle and did not make good hay. Purple straw wheats were much better than white straw for hay. It was well to cut early, for weight and quality of chaff, with good green attractive color. It was a mistake to suppose that better weight was obtained by leaving the cutting until a full grain had formed. Sheaf for sheaf the riper cut stuff was heavier, but there were not so many sheaves per acre or nearly so much weight per acre. The earlier cut hay did not take so much out of the land. It could be cut too green, but for market, especially Interstate markets, there must be some green color in it. Markets such as Sydney, Broken Hill, as well as Adelaide, required to be considered. Medium sized sheaves were the best. The sheaf should be well tied to save waste, and it cut better too. The hay should be left lying in the sun one full day before stooking. A better green color and a sweeter hay would be obtained. It was a mistake to think that weight would be lost. On the other hand, to leave it three or four days was even a bigger mistake than stooking close up to the binder. The stooks should be four or five sheaves wide and as long as convenient. Large stooks were a mistake as there was more damage done by rain and more risk of sweating. Hay should not be carted into a big stack under a fortnight from cutting. The straw should crack at the knots. If permitted to lie about in the paddocks for weeks it became dry and brittle and would not cut; however, it might be damped or steamed. Hay came out of the stack much the same as it went in. There should be a good bed of straw to stack the hay on. One musty damaged sheaf at the bottom was worse to mix with good hay than a dozen discolored sheaves at the top. The stack should be allowed to spring a little so that water running off would drip clear of the walls. Whether butts or heads should be out was a matter of opinion, but the middle required to be kept 4ft. or 5ft. higher than the sides. He favored heads out, because they could be placed more quickly in that way. The roof should be made with the heads out every time. Rain would spoil them, but only the heads, while if the butts were out, heavy rain would spoil the sheaves for two or three layers down. It was well to get the stack covered as quickly as possible, and cover it properly, or all the previous work would be in vain. A good thatch was the only way worth while. The extra expense was trifling. Less straw was required than if put on loose. Mice did less damage under thatch than loose straw. Iron sheds for hay for the farmer's own use were best.

SALISBURY (Average annual rainfall, 18.57in.).

November 7th.—Present: 15 members.

THE HORSE.—A lengthy and instructive paper dealing with the horse was contributed by Mr. R. W. Cilento. The writer of the paper traversed in an entertaining manner the development of the animal from the embryo to maturity. The

anatomy of the animal was explained, and its evolution traced. In the discussion which followed Mr. Fleet said that when his horses were afforded the choice of feeding from the manger or the ground they always preferred the latter. He considered that the latter was the most natural feeding position. A visitor stated that old tram horses, which had been accustomed to feeding in a manger for many years, when taken on to a farm and turned on to the flats proceeded to the hillsides at first, and fed there, until accustomed to the changed conditions.

ANGASTON, October 16th.—Reminiscences of life members were tendered by Mr. R. Player and Mr. W. Sibley, both of whom have completed 20 years' membership of the Angaston Branch of the Agricultural Bureau. Mr. Sibley paid a tribute to the advantages to be derived from membership of the Bureau, and summarised the improvements made in fruit production during his association with the Angaston Branch. Mr. R. Player said that the very many practical papers read at the Bureau meetings and the discussions thereon had done an immense amount of good. Through the instrumentality of the Bureau in advocating new methods, land at Moculta, which had been regarded as worn out for wheat growing, had been brought back almost to its virgin condition. The Bureau system had also been responsible for the education of the people in the use of artificial fertilisers. By the same means the saving of the apricot trees had been brought about and the cincturing of the currant vine had become known. The pioneers of the introduction of spraying sprang from the Bureau.

NANTAWARRA, October 5th.—Mr. Sleep initiated a discussion on the mice plague. Mr. T. Dixon said that if sulphur were sprinkled about a stack of hay, mice would not touch it.

NORTHFIELD, September 5th.—In the report of the meeting of this Branch, appearing on page 316 of the November issue, Mr. Sandercock is stated to have read a paper on farming in the North. The name of the writer of the paper, Mr. R. J. Lamber, was omitted.

YORKE PENINSULA DISTRICT.

(TO BUTE.)

BRENTWOOD.

October 12th.—Present: 17 members and seven visitors

PIG RAISING.—The chief points in pig raising, urged Mr. A. J. Babbage in a paper on that subject, were early maturity, their adaptability to being fattened at any age, and the ultimate heavy weight of matured animal. A pure bred animal was essential, and he favored the Berkshire, because it was a good doer and displayed fine qualities. As regards sows, he was averse to mongrels, and the young of pure breeds did not do well. For bacon pigs, he preferred the Berkshire or the Mid York-Berkshire cross. Sows should not be too fat, because in that condition they were apt to overlay their young. A sow should be put in her sty a fortnight before farrowing, and given plenty of sloppy food to produce milk. No corn should be fed to the sow for a week before farrowing, but she should be give scalded bran, a little milk, and pollard, and it should be given warm. Suckers should be given a free run out of the sty, but the sow should be kept in the pen. Castration should take place at four weeks, and the suckers should be weaned at seven or eight weeks. The young pigs should then be shut up and given good food, such as boiled or crushed wheat and pollard, three or four times per day, but they should be only given as much as they would clean up. When six months old they should have a dressed weight of 120lbs. to 140lbs., and be ready for market. Boars might be used for service when seven months old, but sows should not farrow until 14 months old. Oats and barley made a good change of food for dry sows and boars. Good warm sties were required, which should be 14ft. x 12ft., and 5ft. high at the back, sloping to 3ft. 6in. in front. The back and sides should be of stone, and the front stone work, with an iron rail. The roof should be of iron. He preferred wooden troughs, cut from peppermint or gum logs, about 6ft. in length. They lasted a very long time. A general discussion followed on the

question whether pigs should be run in small paddocks or confined in sties. Mr. Babbage said that store pigs should be run in small paddocks, but pigs for fattening should be shut up.

BUTE (Average annual rainfall, 15.42in.).

September 19th.—Present: 17 members and two visitors.

SHEEP ON THE FARM.—In a paper dealing with sheep on the farm, Mr. D. Walton said that it was necessary for every average sized farm (say 600 acres) to have a few sheep. Sheep very often found good feed in a paddock that was exhausted for horses and cattle. Merino sheep were about the best breed to keep. They were easily kept, and a handy size for killing purposes. It was a wise plan, should one turn out a rogue, to slaughter it as soon as possible, because if one rogue were allowed to go through fences, it would not be long before another in the flock would follow suit. Farmers should breed from a ram of the best quality obtainable. Should the ewes be young, an aged ram, say three and a half years, was preferable, because of better results at lambing time. Moreover, there were not so many deaths among the ewes as if a young ram were used, though that depended a good deal on the season. Sheep should have plenty of water to drink at any time, and not be kept too long in cold, bleak paddocks without a change, as they were subject to colds and rheumatism. Neither was it a good plan to leave them in a paddock where a straw stack was built, because they were apt to rub themselves against it and injure their fleeces. It was also injurious to allow sheep to run in stubble paddocks where the wheat had shed owing to the wind, or had been badly stripped, because a very little wheat would cause death to a sheep.

MOONTA (Average annual rainfall, 15.22in.).

November 4th.—Present: 14 members and two visitors.

LABOR-SAVING APPLIANCES ON THE FARM AND IN THE FARM HOME.—The first item dealt with in a paper by Mr. H. J. Cadd, devoted to the consideration of labor-saving appliances on the farm and in the farm home, was that of water supply. He would elevate water into a supply tank at least 12ft. high with a small mill, and then lay pipes from the supply tank to the kitchen, laundry, bath, and any other places required. In the laundry he would fix taps over each tub and over the copper. If they still believed in the old-fashioned tubs, with the everlasting rub and the tired, worn housewife at the end of the day, then of course almost any tub would do; but he hoped that they were leaving those days behind them. There were now on the market machines which would thoroughly wash, in five minutes, as many clothes as could be washed in an hour by the old hand-rubbing method, and the capital cost was only about £7. The copper should be built into one corner of the room, close to the washing machine. From the washer drain pipes should be fixed to carry off the dirty water. There would be plenty of pressure in the supply tank for baths, and a further saving of labor could be made by providing sinks to carry away waste water. A sink could be fixed at a trifling cost to any kitchen, thereby saving a great deal of hard work. They could be obtained at prices varying from 15s. to 30s. When fixed they also served as washing pans. A draining board could be fitted on one side, and a table top on the other. From the escape at the bottom the waste water could be led into a dry well or bamboo patch, each very effective for using up the wash water. In the kitchen there should be plenty of shelf and cupboard room, also an improved dresser, a double fireplace, and a kerosine stove. Those items he mentioned particularly, but of course there were scores of details. Where possible, he would always place the cellar below the kitchen, which was a great labor-saving arrangement. By fixing a lift to that all the food stuffs, cream, etc., could be run up and down, and there would be still further labor saved. Much work could be saved about the farm in the feeding of stock and poultry, not forgetting the water question also in that connection. If care were taken, the situation of the various feeding centres would help considerably to save labor. The poultry and pig yards should be between the house and stable, and all as nearly in a line as possible, street wise, if desired, so that in one journey all could be attended to. For fowls and pigs he recommended the erection of a bin to store the grain, capable of holding 10 or 12 bags. Those could be filled from the lorry, and when feeding time arrived, it would be only necessary to lift a trap door and the grain would run out. The bin system for storing the feed grain might be used to store all the grain, and the larger bins might take the

place of the smaller bins suggested previously. Water should be laid to each feeding place and in each instance taps should be fitted. There were several systems of feeding horses, but he preferred the system he had established and found to be a very practicable and labor-saving scheme. He had the store room the length of the stable, and the floor on a level with the manger, with trap doors at intervals along the back of the manger. That gave ample room for storing six months' supply of chaff. The floor being on a level with the top of the manger, and trapdoors placed along the manger, the chaff could be easily and rapidly fed to the horses. There were many schemes for feeding, and much more care, in his opinion, should be taken about the arrangement of the feeding contrivances. Much labor could be saved in the barn if the floor were elevated to the height of a low lorry or ordinary dray, then a platform placed along the discharging side of the barn, and on the receiving side the ground should be made up to the level of the floor. Where possible the barn should be built on sloping ground, which naturally helped in construction. In practice a barn of that sort meant that the seed, super., &c., could be unloaded from the lorry on the made side just in the ordinary way. When seeding time arrived, or a load of wheat was required, the real benefit of that type of barn was realised. The greatest saving was made during seeding, when with a sack truck the whole of the super. and seed was simply trucked from the barn over the platform into the dray or lorry, one man being able to load the stuff more quickly and more easily than two men from the usual type of barn.—Mr. W. Edge said that the appliances suggested would not be within the reach of every farmer, but it would be very convenient to have the equipments Mr. Cadd had indicated. Mr. A. B. Ferguson said that all the pressure required could be obtained with a stand 3ft. high, and no mill would be necessary. The stables should be about 4 chains from the house. He preferred the chaff being above the horses in the stable, because they could be fed more easily. The pig yards should be a long way from the house, in order that, when the wind came from that direction, there would be no offensiveness. Mr. W. F. Ortloff agreed with the paper, but considered that the proposals it contained would be too expensive to instal.

MINLATON, October 6th.—Mr. W. Bennett read a paper on the livestock industry of Australia, in which he gave a short history of its foundation and growth, and some of the causes which had contributed to the great shrinkage in the number of livestock in Australia.

WESTERN DISTRICT.

MILTALIE (Average annual rainfall, 14.55in.).

October 7th.—Present: nine members and four visitors.

HAYMAKING.—In preparing ground for hay crop, observed Mr. D. Bagnell in a paper on haymaking, it should be fallowed to a depth of 3in. or 4in. and kept free from weeds. It should be harrowed after every good rain to conserve all the moisture possible. Great care should be exercised in freeing the ground of stumps and stones. He recommended sowing in the middle of April, if the ground were really suitable, with a bushel to the acre of either Golden Drop, Gluyas, or J. 4, and 60lbs. of super. When the crop was up, and had taken good root, it should be harrowed and rolled if necessary. He was averse to sowing wheat and oats mixed, and favored cutting a certain amount of each. That could be judged by the amount of twine used, and load for load of each placed in the stack, because it saved the second handling of mixing sheaf for sheaf when cutting chaff. In regard to the time for cutting hay he favored wheat and oats being cut in a well advanced stage when it was of a greenish yellow color. Sheaves should be stooked as soon as possible. The stooks should be oblong, four sheaves in width, each stook consisting of 30 to 40 sheaves, except in cases where labor was scarce and the hay could not be carted before harvest. In that case it would be better to make the stooks two or three times as large in order to prevent them being blown about and bleaching. When stacking hay in the open, stones or wood should be used for dunnage, logs being preferable, because they could be readily shifted as soon as the hay was removed. For a stack of wheaten hay containing 30 to 35 tons, the

dimensions should be about 36ft. by 18ft. The weight could be gauged by the amount of string used, allowing 24 tons or 26 tons to the bale in a crop of average height. When building the stack, the middle should be kept fairly full in order that it might be 3ft. or 4ft. higher than the outside walls when commencing to make the roof. When roofing, he favored making the eaves by placing long sheaves with their butts outward about 9in. over the side of the stack. A finish should be made with the heads out, tying the top sheaves securely to keep them in position; a covering of about 1ft. of straw should be put on as soon as possible. Mr. L. Aunger did not favor placing the heads out on the roof of a stack, because it would spoil the best of the hay. He would make hay from oats, since they had to be grown every year. He would not place stooks in hollow ground lest they be spoiled by the rain. To save time in stooking, it was advisable to take as much as possible on the sheaf carrier. Mr. J. S. Jacobs considered that it was better not to grow oats and wheat mixed. Green hay made better feed. Mr. P. J. Eachen said that sufficient care was not paid to stooking. He favored cutting hay green.

MILTALIE (average annual rainfall, 15.45in.).

November 18th.—Present: eight members and four visitors.

HARVESTING.—Commencing with the advice that all the machinery should be overhauled, and spare parts obtained to replace probable breakages, Mr. J. P. Story, in a paper on harvesting, proceeded to say that there were four methods of gathering the crop, namely, by use of the harvester, stripper and winnower, binder and thresher, and reaper-thresher, each of which had its advantages and disadvantages. A 5ft. harvester would cost £100, but, with a good team, a farmer could take off the crop himself, sew the bags up, and cart them to market. With a little additional trouble he could save the cocky chaff. However, the bags of wheat had to remain in the paddock until the crop had been reaped, and many of them probably not sewn up. They would, of course, lose weight, and if the ground were damp the bags would rot at the bottom. A reaper and hand winnower would cost about £100. The reaper did not require so many horses as a harvester and the upkeep was less. It was necessary to employ labor to clean the wheat, but the cocky chaff was saved and the wheat would not be standing so long in the paddock when bagged, and therefore would not lose so much weight. The binder and thresher would cost £150, but there was a binder on every farm, so that there would only be a thresher to buy. If three farmers bought a thresher between them, each could cut and stook his own crop. It would be necessary for each to employ a man for stooking, but they could all work together, carting, threshing, and stacking the straw. The weight and color of the grain harvested by that method excelled all others, and there was the stack of straw as a stand-by. There were seasons, however, when the crop was too light to bind. In that district the ground was too uneven for the cumbersome machinery of the reaper and thresher. Mr. J. S. Jacobs concurred in the view that wheat lost weight while left in the paddock. He preferred the stripper and winnower, because reaping could be commenced sooner, and would not lose weight in the heaps so much as in the bags. The binder would be too expensive, because of the price of string and the labor required. Mr. P. J. McEachen preferred the harvester, because it would save more wheat, and it was possible to save the cocky chaff. The binder and header caused too much work. Mr. H. R. Jacobs preferred the stripper to the harvester. Mr. W. E. Hier said that the bags were too dear to leave out in the paddocks to rot. After damp weather the white ants were very bad on the bags. Farmers should lay out a good piece of floor for harvesting. He preferred the stripper and winnower to the harvester, which blew out wheat. The only self sown crop in that district was in a paddock which had been reaped by a harvester last year. Mr. W. G. Smith preferred the stripper to the harvester, though it might pay sometimes to cut portion of the crop with the binder and use the header. Mr. J. W. Story did not believe that the harvester wasted any more wheat than the stripper. Mr. L. Aunger referred to the great difference in the various makes of strippers. He favored the 7ft. damp-weather stripper with a five-horse team. The new makes of strippers were much lighter than the old sorts. After cleaning up it would pay to drive the pigs down the paddocks to the floors, which they would clean up thoroughly.

ROBERTS AND VERRAN.

November 7th.—Present: five members.

CARE AND MANAGEMENT OF HORSES.—Stipulating first for a good stone stable, well ventilated, with a well-thatched straw roof, Mr. F. Imhoff, in a paper on the care and management of horses, proceeeded to urge that if one side of the stable were left open, it should be the eastern side, because less wind and rain came from that quarter. The yard for the horses should be on elevated ground, to ensure effective drainage. Horses should be tied up in their stalls. In feeding, the first feed when the horses came in from work should be of long hay, and the last feed at night chaff. In the morning and middle of the day crushed oats and bran might be given with advantage, because there was not so much time to eat it. A piece of rock salt in the manger was beneficial. A dose of Epsom salts once a week ensured good health. Clean straw for bedding should be provided every night, and each animal well groomed every morning. Medium draught horses were best for farm work, and for breeding a good docile mare should be selected, and should not be bred from until five years old. Mares should be kept in constant work until three days from foaling, but should not be used in places where they might be bumped or knocked about. A good stallion should be selected. Young horses required to be properly mouthed before being put in a team. Pipe collars were the best, and it was essential that they should fit well. When lumps or sores came on the shoulders, the horse should be spelled or the collar eased off. For scalded shoulders a false leather collar was advantageous. The hoofs should be coated with Stockholm tar every week, to prevent cracking.—Mr. F. Masters would give long hay for last feed at night, instead of first, and was averse to dressing the hoofs with Stockholm tar too frequently. Mr. W. McCallum favored a thatched roof with sheaved straw first, and then covered with loose straw, which would keep out the wet. Mr. A. F. Cowley preferred an iron roof, because straw generally leaked and was a harbor for sparrows and other vermin. The opening in the stable should be towards the north-east, because the wind from that direction was not cold, and rain seldom came from that quarter. He was against giving horses medicine frequently—the less medicine administered the better. Mr. W. Sharman favored an iron roof, because straw was leaky, and it was better for the horse to be in the open than under a leaking roof. He preferred giving horses chaff for both night feeds, because it gave them time to finish their feed and get sleep and rest, which they required after a long day's work.

YADNARIE (Average annual rainfall, 14.09in.).

October 11th.—Present: 10 members and one visitor.

HINTS ON FARM MANAGEMENT.—In a paper dealing with farm management, Mr. W. L. Brown observed that a systematic consideration should be given the financial aspect of the farm. An endeavor should be made to put in a sufficient area to provide, under average conditions, a return large enough to meet obligations. Care and economy should be practised, and some system of bookkeeping was necessary; that could be facilitated by making all payments by cheque. Haystacks or crops could be insured if the farm were situated in a mallee district. Mr. G. B. Kobelt considered time-payment necessary. Some well established farmers bought their machinery on the hire purchase system. Mr. J. H. Kruger said that taking the average of the district as the probable yield, was an evidence of sound judgment. Farmers should keep books of some sort. Some cash transactions could not be put in the heel of a cheque book and were lost sight of.

YADNARIE.

November 11th.—Present: nine members.

SHEEP ON THE FARM.—A paper, contributed by Mr. E. C. Kruger, was read by the Chairman. The writer premised that it was rather difficult on a new mallee farm to keep sheep at once, but every farmer, after two or three years on the farm, should commence the rearing of sheep. About 50 six-tooth or full-mouthed Merino ewes off the shears would be the cheapest to start with, because young ewes were poor mothers. He would prefer to mate them with a good Dorset Horn ram. The Dorset Horn was a nice sheep, of big frame, with clean points, which was essential in that district. The pure Merino was known to be rather wrinkly, and too woolly about the head, necessitating more careful attention than was required for clean-pointed sheep, which were better doers than the pure Merinos. For wool Merinos were best; but it was necessary to take into consideration the sale of mutton, which

was a large item. Ewes should be mated about the middle of November, and the ram allowed two months, which would secure an April-May lambing. The rams and ewes should not be too fat. Ewes might be mated when one and a half years old with fair results, but a ram should not be used until it reached the age of two and a half years. All ewes with blind teats should be set aside for killing. Lambs should be tailed when six weeks or two months old. It was unwise to run the rams with the ewes all the year, because there would be lambs dropped at shearing time, which was very annoying to the shearer, and often very unprofitable to the owner. Besides that, lambs dropped in mid-summer would not develop satisfactorily without some kind of green fodder. The best time for shearing in that district was from the middle of September to the end of October, and great care should be taken with the wool, because the presence of pieces of chaff and other rubbish greatly reduced the value. For small flocks it was unnecessary to skirt and class the wool extensively. All that was requisite was to remove the stained and short wool from the legs of the fleece. Bales should not be filled too tightly, or they would weigh too much and possibly spoil the sale.—Mr. W. Jericho said that it was not profitable on a farm to have only one lambing in a season. Mr. J. J. Deer preferred leaving the ram with the flock all the year, provided the flock was small. The second cross with the Dorset Horn ram was not profitable, because the wool was apt to deteriorate. Mr. A. Spriggs was in favor of summer lambs, for they kept going on the weeds which sprang up after summer rains. He had killed summer lambs weighing 54lbs. Mr. W. L. Brown said that sheep were as good as a cultivator in keeping down weeds. The Merino was essential to good wool. The small farmer's wool was not sold at per bale at the big wool sales. Mr. J. E. Quick said that a farmer would realise more money by selling a star lot of four or five bales and the rest separately than by making a class of, say, 14 bales.

CUMMINS, October 14th.—Mr. J. Durdin read a paper on the cause and effects of "Takeall," and suggested that there might be some connection between the swarms of flies, which infested areas attacked by takeall, and the causation of the disease. In the discussion which followed, Mr. W. Blucher said that the first effects noticeable in wheat affected by takeall was a net-like veil around the roots.

GREEN PATCH, November 10th.—Discussion took place on haymaking, members being equally divided on the question whether hay should be cut on the green or ripe side. It was considered preferable to build long stooks, if constructed firmly, otherwise the wind was likely to damage them. Hay should stand 10 or 14 days in the stook before carting. White Tuscan, Marshall's No. 3, and Baroota Wonder were the best varieties of wheat for hay, though oats undoubtedly gave the best return. Mr. G. Merchant produced a fine sample of Western Wolth rye grass, grown on a rich black flat, which had been flooded with the winter rains. He cut it for his cows three times. He advised anyone with rich black soil to give the rye a trial as green fodder for the cow.

KOPPIO, November 7th.—Extracts from a paper entitled "Wheat after Peas" were read and discussed, the general opinion being that peas could be grown with profit on many portions of the farms. In discussing the class of soil most suitable for that crop it was agreed that light loamy soil gave the best results. Peas in that district should be sown fairly early. Members agreed that there had been a marked improvement in the yield of wheat paddocks which had been previously cropped with peas.

KOONIBBA, October 5th.—Mr. E. A. Hastings read a paper on horse breeding and rearing, in which he urged all farmers to breed horses now, and by the time they were ready for the collar, prices would not be below those now ruling. He preferred a nuggetty draught horse, and it should be sound. Great care should be taken that quality was predominant in the sire. Attention should also be paid to the hair on the horse's legs, a fine silky character indicating good quality of bone. Breeding did not interfere with the mares' farm work, for they could be worked almost up to the time of foaling. After the foal had been dropped, the mare should be put in a good paddock with abundance of feed to enable her to produce sufficient milk to thoroughly nourish the foal and give it a good start. The colt should be left with its dam for six months and then should be taught to feed out of the manger. It should be kept in good condition for the first two years, when a good foundation would be laid for life. Discussion ensued and the views of the writer of the paper were endorsed.

KOONIBBA, November 9th.—Mr. W. Port contributed a paper on the feeding and care of horses. In the discussion which the paper evoked Mr. Foggo said that he was against giving horses hay at night. He preferred short feed, because the animal would empty the manger and then rest. With hay the horse picked out the best portions and wasted the remainder. Members agreed that horses should be watered before feeding because it stimulated the appetite.

PENONG, November 12th.—A discussion took place on fallowing, in which it was urged that it was essential to harrow in warm weather to kill weeds, which, in many instances, would be otherwise only transplanted. Crops harrowed twice were noticeably cleaner than those only harrowed once. Fallowing enabled the farmer to prepare the land before the busy time of seeding.

YADNARIE, September 9th.—Mr. G. A. Dreckow read a paper entitled "Hints to a Beginner on a New Farm," and said that a beginner on a farm required to be in a fair financial position, and beyond that it was necessary to know the best use to which to put his finance. Many bought useless ploughs and other implements and poor horses, which were unfit to do the work for which they were intended. Many depended too largely on the coming season. Mr. Crossly said that with a fair amount of capital and a series of good seasons, a farmer should succeed. Mr. Deer said that the best equipment for a beginner was good judgment and a good pocket. On a new farm a man required plenty of pluck and determination, young horses, and good implements. Mr. G. B. Kobelt said that farming under existing conditions was very hard on the beginner. Mr. Crossly said that in that district a capital of £400 or £500 was required to commence with. Mr. Spriggs said that if a man had a good plant he could safely start on £200.

YANINEE, September 23rd.—Mr. L. Noble read a paper on water conservation, in which he urged the construction of dams at localities where the general convenience or farm would be best served. It was always well to provide for the conservation of more than enough. Provision for water three years ahead was fairly on the safe side. Excavations should be deep rather than wide to minimise the effects of evaporation, a breakwind would also assist in that direction. A tank or dam should not be placed in the lowest part of a depression, but a little above it in order that it might be securely closed and the water drawn off by a syphon to a trough. That avoided the pollution of water by the stock and was more economical in every respect.

YEELANNA, November 11th.—Discussion took place on numerous subjects brought before the meeting by means of a question box. In that way several matters of interest were debated.

EASTERN DISTRICT.

(EAST OF MOUNT LOFTY RANGES)

BOOKPURNONG EAST.

October 7th.—Present: 12 members and one visitor.

"GO ON THE LAND."—Under this title a paper was contributed by the Hon. Secretary (Mr. V. V. Crase). He dealt historically with attempts at decentralisation in the early civilisations, and referred to the influence of environment on the individual and the race. The importance of agriculture to Australia, he contended, was paramount, and the scope for its development most wide. The relative merits of the city bred and country bred farmer were discussed, and the conclusion reached that each had much to learn from the other.

BERRI, October 13th.—Mr. Walter Muspratt read a paper on cincturing the vine, in which he declared that the best time for the operation was when from 5 per cent. to 10 per cent. of the caps had fallen. Care should be exercised in making the cincture, and it should be protected from the sun by waxed calico torn into narrow strips, which would completely cover the cut. It was essential to cincture currants to enable them to be profitably grown, but it was inadvisable to make a practice of it with sultanas. He admitted that a heavier crop would set but it was at the expense of the vitality of the vine.

BRINKLEY, October 7th.—A paper was read by Mr. A. Martin on rolling scrub and burning off, in which he said that the most suitable time for rolling down scrub was August, September, and October, because at that period the mallee broke easily and a fair number of stumps were pulled up. If rolling were done not later than October, the shoots would make a good growth and the scrub would be thoroughly dry before burning off. A light iron tube roller was found most suitable in that district. Burning off should be done in February, or the first week in March, because that would give time to clear off any sticks left by the fire, before ploughing was commenced.

COONALPYN, November 9th.—Mr. J. Hill read a short paper on oats in mallee land. In the discussion which ensued Mr. F. F. Whitehead said that he would sow wheat instead of oats for the first two crops on mallee land. In a fair season, with the aid of a fire rake, almost as many shoots could be scorched as if oats had been sown. The third year he would sow oats and then fallow, which was always necessary after oats if wheat was to be grown. Mr. Whitehead then delivered an address entitled "Some factors of importance in the management of a scrub farm," and said that February and March were such busy months, with the completing of burning operations, fire raking, and harvesting, when the farmer should be on fallow or in other ways preparing for seeding, that it was almost impossible for a man to succeed alone. Two men in the long run would do three times the work of one. Where there was plenty of room to work it would be wise to have three men all told and aim at a big acreage. A haystack was essential, and provision should be made to handfeed stock. Two or three good cows should be kept, and one-fourth of the crop every year should be oats. Eleven horses were required, or at least a drill and cultivator team. Fallow made larger crop areas possible, because the bulk of the work was done the year before. It would pay to sacrifice a year's stump carting and expend the time on getting ahead with the work on the land. As soon as all roots were dead dressings of super., as heavy as could be afforded, should be put on the land. Marked benefits in pasture followed supered lands.

HALIDON, October 11th.—Mr. E. H. F. Muecke read a paper on the advantages of married life on the farm, which was well discussed.

KINGSTON-ON-MURRAY, October 21st.—A discussion took place on the destruction of cut worms. Several remedies were suggested. Arsenate of lead had not proved satisfactory. A string saturated with tar and tied around the vine or tree close to the ground, it was said, had given good results. The primitive method of scratching around the trees and vines and killing the worms with the thumb and finger had been mostly resorted to, and though slow, was effective.

MANTUNG, October 13th.—A visit of inspection was paid by the Branch to Veitch's Well Experimental Farm, where Mr. W. J. Spafford, Superintendent of Experimental Work, delivered an address on cultivation and the preparation of a seed bed. At the conclusion many inquiries were answered by Mr. Spafford.

MONARTO SOUTH, November 11th.—Mr. A. Harper read a paper on the construction of pigsties. He urged that a site selected for the sty should have fair drainage for rainwater. The ground should have a slope towards the back. The sty should be built of stone with an opening at the back for cleaning purposes. The floor should be bricked, and across the sleeping portion the bricks should be stood on end to form a low wall, which would retain the bedding in its place. The roof should be of straw, because it was cooler in hot weather and warmer when the weather was cold, and should project over the front to keep the rain out. If preferred iron might be placed over the thatch of the breeding pens. Stone cemented troughs were best, because they could not be rooted out of their places. A small sty for the young pigs to feed in should be erected alongside the main structure, with a small opening between, just sufficient to enable the little ones to pass in and out. Discussion took place as to the manner in which the sty should be managed at farrowing time. Generally the recommendations of the paper were approved.—Mr. A. Forbes read a useful paper entitled "Little Things which Count." Members agreed that the advice in the paper should be taken to heart, and strictly carried out.

MORGAN, October 13th.—A paper on farming on poor mallee soil, written by a member of the Claypan Bore Branch, was read and discussed.

MURRAY BRIDGE, October 9th.—Mr. W. J. Spafford, Superintendent of Experimental Work, delivered an address, "Diseases of Wheat Crops," which will be published in a future issue of this *Journal*.

PINNAROO, November 1st.—Mr. W. J. Spafford (Superintendent of Experimental Work) delivered an address which will be printed in a later issue.

RAMCO, October 9th.—Mr. R. Stanley read a paper. A growing tree would not stand the strain of bearing big crops, he said. It was a mistake to prune a tree hard for three years, and then allow it to grow. His advice was to prune it hard for five or six years, for by doing so both fruit and tree development would be secured. He had seen six or seven arms left on trees the second year, but no young tree could stand that strain for long. The tree should not be checked in its growth until five or six years old. To form a tree two years old, the second pruning should not leave more than three main arms. As the tree grew and spread, the spaces should be filled with secondary arms. To secure a good take and a good growth, the land should be cultivated once or twice between each watering. Mr. Lewis considered that young trees should be allowed to bear earlier, even if it shortened their life. In a general discussion, the consensus of opinion was that trees should be pruned hard for the first six years and not allowed to bear heavy crops of fruit.

RENMARK, November 9th.—A paper was read from a horticultural publication, dealing with the control of the export of pears and apples. Discussion ensued, and the subject was deemed so important that it was decided to suggest that it be included in the agenda paper for the Murray Conference, at Waikerie, for consideration.

ROSY PINE, November 8th.—Mr. R. T. Hay read a paper from a pastoral publication on horsebreeding. Mr. J. Docking said that the breeding of remounts was more profitable for the station owner than the farmer. Mr. F. G. Bonnin said he would like to see a Percheron sire imported into the State.

WOODLEIGH, October 19th.—Mr. E. Good read a paper on handling young horses, which provoked considerable discussion. Mr. H. J. Finnis, Acting Secretary of the Advisory Board, delivered an address on the advantages of the Agricultural Bureau, and Mr. D. F. Laurie, the Poultry Expert, gave an address entitled "Poultry on the Farm."

WYNARKA, November 11th.—Mr. A. J. Bartlett read a paper dealing with sore shoulders in horses. It was of the first importance, if sore shoulders were to be avoided, that collars should fit well, and in that respect, it was better that they should be a little tight rather than loose. Adjustable hames, which could be made to suit horses carrying their head very high or very low, were advisable. Horses which had done no work for some time were soft, and inclined to be fresh; unless checked and kept well in hand they would quickly develop sore shoulders. If driven steadily until they developed hard condition, the trouble would be avoided. The method of breaking in also had some bearing on the question, and he strongly advised putting a young horse in a wagon first. It was a dead pull, and taught a horse to pull steadily. Members agreed that there was little danger of sore shoulders with well-conditioned horses and well-fitting collars.

SOUTH AND HILLS DISTRICT.

BLACKWOOD (Average annual rainfall, 27in. to 29in.).

October 16th.—Present: 15 members and 17 visitors.

CO-OPERATION.—Mr. F. Green (Secretary of Forest Range Fruitgrowers' Association) read a paper on co-operation. He contended that their present methods of marketing fruit were obsolete and should be improved. Except in a few instances the exportation of fruit was done by individuals, consequently there was great diversity in the methods of grading and the branding of the grades. The methods employed in marking the grades were startling in their variety, for no two men adopted the same marks for a particular grade. There was also lack of uniformity in packing and marking. The marks "A" and "AA" were all right if the fruit contained under the same marks was the same. For instance "A" could

indicate 2¼in. apples, "AA" 2½in., "AAA" 2¾in., and so on, but the simplest method was to brand 2¼in., 2½in., 2¾in., &c., but each case should contain the grade marked upon it. In many cases, under existing conditions the 2¾in. grade often contained 2½in. to 3in. apples. The multiplicity of grades and varieties was against successful trading with oversea markets, and without co-operation that multiplicity would not be overcome. For instance, it was necessary for the individual to book space in the boats months ahead. He expected a certain number of cases of special varieties of apples, but, owing to the fruits failing to set or damage to the fruit due to hailstorms or winds, &c., could not fill the space with those particular varieties. Sooner than pay for empty space on the boats he filled up with several varieties and grades. With co-operation those conditions, to a very large extent, could be overcome. Many of the growers in South Australia did not possess large orchards, and consequently in an off season could not pack a sufficient number of cases to make a parcel large enough for export, whereas, with co-operation, if 30 members had only 10 cases each, they could make one fair parcel of 300 cases. As the larger exporters became known, the smaller man was forced off the market because he could not guarantee a continuous supply from year to year, whereas the bigger exporter became known and his fruit was readily bought, especially if the buyer were sure that fruit bearing his brand were true to description. At present fruit shipped was not always properly graded, for if it were considered that 2¼in. apples were the smallest grade that should be exported, and of that size 228 fruits filled the bushel case when packed on the diagonal system, conclusions could be drawn as to the grading and packing when 436 apples were counted in one case sent for export, and that was not an isolated instance. Quantities of apples were sent away which should never leave the State. The Commerce Act merely enforced correct trade description, and so long as the fruit conformed with the description on the case, it could be exported. The inspector should have power to withhold fruit unfit for export. Once a good name was lost it was difficult to regain the buyers' confidence. Good fruit should always be sent, not necessarily large fruit. A good 2¼in. apple was always sought after, but nothing smaller should be exported. The fruit should be sent in accordance with the requirements of the market on which it was to be sold. With co-operation one man controlled the export of the district, and passed all the fruit. The success of the scheme depended upon that man. It was necessary, therefore, to be very careful when the appointment was made. The duties of the manager were not always pleasant, because some growers' methods and fruit were not the best, and the manager needed to be a man of backbone, who could unhesitatingly reject inferior fruit. Once a brand secured a good name it was sought after, and parcels could be sold forward at very remunerative prices. That could only be accomplished by co-operation, except in the case of a big grower. By purchasing materials co-operatively great savings could be effected. The general practice was for the grower to purchase his few cases through an agent, involving the payment of the agent's commission, whereas, if bought through an association the mills allowed 2½ per cent. on 1,000 cases, 5 per cent. on 2,000 cases, and 7½ per cent. over 4,000 cases. The same applied to the purchase of wood wool and wrapping paper. One great objection to co-operation was that the grower did not see why he should pay for packing when he could do it at his home in his own time, but, at the end of the season, it would be found that the packing had been done more cheaply and efficiently at the packing sheds, because there was enough saved in the purchasing of materials to pay for the packing. The association should be managed by a chairman, five leading growers, and one paid officer, the secretary, who should be paid in accordance with the work he did, usually 1d. per case for the fruit handled. Cool stores were necessary in connection with the local markets, so that produce could be put in and taken out when necessary, thus avoiding the glutting of the markets. In Sydney the markets were municipal, and the cool stores formed one wall of the markets, and had elevators to the floor of the markets. When a glut occurred the excess of fruit and vegetables was stored and supplies regulated. The South Australian system of marketing was wrong. It should be done co-operatively. The scheme was too big for the whole State, but each community of growers could combine to have its own co-operative saleroom with a staff to run it. The produce sent to the saleroom would be unloaded, the driver would receive his delivery note and leave for home instead of being compelled to remain around the markets most of the day. It is necessary to be on the

lookout for new markets, and in that connection the association had a great advantage over the individual. A quarter of a million bushels increase in the apple crop was recorded last year, and the quantity was increasing from year to year, so that growers required to be ever on the watch for improvements and new markets. In reply to a question whether carting apples loose in cases to the packing sheds would not bruise them, Mr. Green stated that it was only a few top layers of apples which rolled about that caused the trouble. A few bags put upon the top of the case held the fruit firmly. No trouble had been experienced when that had been done.

FOREST RANGE (Average annual rainfall, 35in. to 36in.).
November 9th.—Present: nine members.

HINTS ON GRAFTING.—A paper giving a few hints on grafting was read by Mr. J. Green, who said that it was best to select the most suitable method of grafting and adhere to it. Continual changing militated against proficiency. For nursery and young trees the tongue graft was best, and to get the best results a commencement should be made early, the end of July being best for plums, but stone fruits should be budded. There were always some misses after budding, and they could be grafted successfully just under the ground. The same applied to cherries. Apples should be commenced early in August, and then the scions could be taken straight off the trees, but if not completed early the wood should be cut and heeled in the ground, because if the sap rose, there would not be a good take. When using the tongue graft the stock should be cut back-handed in order that when cutting the tongue it would lie in front of the operator. In that way the tongue to cut in the scion would also be in front of the operator. After grafting, about three turns of wax rag should be bound tightly round the graft. With a little practice 95 per cent. of success was not too much to expect. When cutting down old trees he preferred to graft on the small wood with the tongue graft, but if there were not sufficient small limbs he would take limbs up to 2in. through and cut slanting across, using the limb as a lever. Then the scion on both sides should be cut, making a wedge. The shoulder should be pressed against the limb to open the cut, and then the scion put in. After removing the shoulder the scion was quite tight, and it should be bound about twice round with wax rag. The limb should be cut off about 2in. away from the graft. If shorter, it might die back and spoil the graft. The following year it should be cut quite close. That made an excellent graft, and soon grew over. He had not had one blow off. Being put in on the top of the limb the saw cut was downwards, and the weather did not damage it so much. That graft could be used in very small limbs, and was pretty sure to take. Proficiency in those two grafts would fill all requirements. Mr. McLaren said that the tongue graft was the surest. Mr. H. Waters considered that the cross method was very serviceable. Other members endorsed Mr. Green's views.

GUMERACHA (Average annual rainfall, 33.30in.).
October 9th.—Present: nine members.

DAIRYING.—Discussing the principles of dairying, in a paper on that subject, Mr. C. Jamieson, after insisting upon the necessity for pure-bred stock, expressed a preference for the Shorthorn, though he believed that the Jersey was the better creamer. The former, however, produced a bigger calf, and the cow was larger and quieter. The selection of a bull was all-important, and it would be found more profitable to pay £30 for a pure-bred animal than £10 for a "scrubber." Another essential was the testing of the cows by means of the scales and the Babcock tester. There was a difference of 80lbs. of butter per annum between some cows, and the poorer cow required about the same amount of food. One would show a profit of £2, and the other of £6, therefore as much profit was made from the one good cow as from three inferior animals, and only one-third of the labor and food was requisite. Dairymen should breed their own cows, and unless all were tested, it might happen that the least profitable animal was being bred from. Testing might be carried out by the purchase of a tester or by forwarding samples of milk to the Government Dairy Expert, the charge being only 3s. per cow per annum. Proper feeding was another essential. No matter how well bred the cow, its profitableness diminished if it were not properly fed. Dairymen should grow as much of their own fodder as possible, and to that end lucerne was one of the best foods for milch cows. Kale, mangolds, barley, and oats were also very useful for

the production of milk. Bran and chaff, especially when they were as cheap as they were at present, should be extensively used for milk production.

HARTLEY.

October 12th.

A large number of members and visitors, including Messrs. G. R. Laffer and R. A. O'Connor, M.s.P., and H. J. Finnis (acting secretary to the Advisory Board), visited the homesteads of different members of the Branch. The majority of the holdings inspected were situated along the banks of the Bremer River, and particular interest centred in the various methods of water distribution that were in practice. The first place of call was the farm of Mr. F. Lehmann, where water was being distributed by gravitation over an excellent plot of lucerne, the water being run through a channel cut in the bank of the river for a distance of about half a mile. After partaking of lunch as the guests of Mr. and Mrs. Lehmann, the party journeyed to Mr. J. C. Sanders' holding, where water was being raised from a bore 306ft. deep by means of a 6h.p. engine, pumping into a 20,000gall. steel tank, at the rate of 800galls. per hour, and distributed by means of overhead sprinklers over a vegetable and fruit garden. At Mr. H. Reimer's property, also, overhead sprinklers were distributing water from the Bremer. The final place of call was the fine property belonging to Mr. B. Wundersitz. The crops here gave splendid promise, and the general appointments and appearance of the place were all that could be desired. After an inspection of the holding, the visitors were entertained as the guests of Mr. and Mrs. Wundersitz, speeches being delivered by Messrs. Laffer, O'Connor, and Finnis.

KANMANTOO (Average annual rainfall, 17.90in.).

October 9th.—Present: eight members and two visitors.

Co-operative Purchase of Dairy Bull.—Commencing with the declaration that the bull was the main half of the herd, Mr. W. G. Mills, in a paper on the co-operative purchase of a dairy bull, continued that he would like to see all farmers in a neighborhood combine to purchase a really good beast. Each of half a dozen farmers or more, should pay £1 for each cow he wished to breed from. If two members had 10 cows each, two had six cows each, and two had four cows each there would be a total of £40, which would be sufficient to purchase a good animal. He did not mean merely a big handsome beast, but one of a good milking strain, which should be the first consideration. The records of his dam, great dam, and great great dam should be secured, and only a bull with ancestors on the dam's side of excellence in milk and butter production should be purchased. Having secured the bull, the question arose as to its keep. He considered that one of the members of the co-operative scheme should take the bull and keep it, either in a stable or in a perfectly secure paddock. It would require to be well fed and attended to, which would entail both expense and trouble and probably the keeper of the bull would require to be rewarded in some way. The other members would bring their cows along to the bull when service was required. In a sparsely settled district, such as that, the driving about of the cows would be too big a proposition. To overcome that each member should have the custody of the bull for a certain period of the year, according to the number of shares he held. Such a scheme would provide better stock on the farm and make both masters and servants more interested in their work.

LONGWOOD (Average annual rainfall, 37in. to 38in.).

October 7th.—Present: 12 members and two visitors.

Orchards and Orchard Work.—A paper by Mr. C. H. Beaumont, Inspector of Orchards, on orchards and orchard work, was read by Mr. J. C. Blakely. The writer of the paper said:—"I am sure that all present will agree with me when I say that it was never intended that fruit trees should be grown in any haphazard fashion, and it is necessary that every care should be taken in selecting the site of the orchard. The site means such a lot. We have to remember, when planting fruit trees, that we are planting for a lifetime, or, indeed, more than a lifetime. We should not be called upon to replant many of the trees every year or two. The proposed site for deciduous trees should have a good free soil, with clay subsoil. Trees may exist on sandstone beds or cold clayey gravel, which is a bog in winter and like cement concrete in the summer; but, unless they are placed in good soil

the trees will not be fine and big, able to carry heavy crops of good-quality fruit, and it is only from such that profits are made, that is, in South Australia. The site should be sheltered, one to which the hot north wind and the heavy westerly gales will not have direct access, and, if possible, it should be where the rising sun will not strike immediately on the trees, when hard frosts are about, but will shine over the top of them for a little while and bring about a gradual thawing. Land with a gentle slope is best, so that cultivation may be done by horse or motor traction. Steep hills will, of course, grow good fruit if the soil is there, but the cost of working and of harvesting is prohibitive. Do not select a site for a house and then plant the orchard about to enhance the view. Think of the trees first; remember that it is from them that the livelihood has to be obtained. The home can be placed in a convenient spot near by. The preparation of the ground will depend on whether it is bare or covered with trees. It frequently happens that land which has been used for cereal crops in the hills is put into trees; such land should be ploughed and subsoiled as hereafter described, levelled off, and kept as a clean fallow for at least one season. Forest land must of necessity be cleared. Do not imagine that you are going to save time by planting your trees in holes dug in the middle of growing scrub; it is a waste of time, a waste of money, and a waste of trees to go about planting in this fashion. Clear the land first and grub out everything. Put the small bushes and branches into many little heaps, to be burned, keeping any useful firewood or sticks which will cut posts to be dealt with while the rubbish is drying—that is to be carted to convenient places for future use. Burn all the rubbish and spread the ashes by dragging a set of harrows, in which a quantity of brush is fixed, over the land. When grubbing big trees, care should be used to keep the top soil and subsoil apart, so that each can be replaced in its proper layers when refilling the holes. I desire to emphasise the necessity for making a thorough clearance at the first operation, so that it will not be a continual expense on the orchard for grubbing shoots. Any outcrops of stone or loose boulders should be removed from the land and placed in a handy position for roadmaking when required. The methods for blasting out or working out the stone do not concern us at present. The clearing should be extended at least a chain outside the proposed boundary of the orchard. After all the holes have been filled, the land will be ready for the first ploughing. This is best done with two single-furrow ploughs of heavy build. The right sort of plough and the right sort of ploughshare and good horses, and men who know how to handle them, are wanted for this job. The leading plough should have a mouldboard on, and should turn the furrow to a depth of about 6in.; the second plough, without a mouldboard, following in the furrow, and stirring up another 5in. or 6in.; and so on, until the whole of the land is broken up to 11in. or 12in. in depth. This work should be done as early in the winter as is possible. Leave the ground in the rough for the winter, to soak and disintegrate. When the weeds start, and before there is any chance of the soil setting hard, thoroughly work the land with a cultivator, and level it, and at the same time work it to a fine tilth with a heavy set of harrows. If any special levelling is required, attend to it at this time. For the first season I am in favor of keeping the land clean and well cultivated; no weeds should be allowed, and a stirring should be given after every summer rain. By this means the land is sweetened and made ready for the trees. It pays to take every care in preparing the land. Even if it takes two seasons to do it, the trees will be worth double the hurried ones by the time 10 years have elapsed. After the land is prepared, it is advisable to draw out a plan of the orchard. Make it big enough to show all the trees clearly; put the rows in the most convenient position for future working, taking care to allow for any necessary roads and wind breaks. The best lines for your fence and outlets to the sheds and main roads can then be obtained. The fence should be completed before any planting is started. Fencing is a fine art, and no doubt many will not agree with my ideas; but any fence to be erected must be vermin proof and also cattle proof. To make it boy proof would be an advantage, but so far that is beyond the power of the average orchardist. I would recommend that the fence should consist of good strong posts, not more than 9ft. apart, and wire not finer than No. 8. The bottom wire should be 3in. from the ground, the second in the centre of the netting, the third at the top of the netting. Nine inches above the netting run a barb through, and 9in. above the barb another plain wire. The netting should be of 1½in. mesh, 3ft. 6in. wide. It should be trenched into the ground at least 4in., and then thoroughly fastened to the wires prepared for it, including the centre wire. The gateways require to

have special care given to them—they are danger spots. The gate should swing level, and the crossing should be paved with stone or with a faced log, on to which the bottom bar will close. The gate will, of course, be covered with a wire netting. There is room for a design for a good and strong orchard gate."

MOUNT BARKER (Average annual rainfall, 30.93in.).

October 10th.—Present: 31 members and one visitor.

PRUNING.—Propounding the questions whether it was necessary to prune fruit trees, and whether it paid, Mr. J. Brinkley, in a paper on pruning, answered both questions in the affirmative. He said that it was possible to have much useless wood in the tree, one branch robbing the other, until eventually it would be unprofitable. A tree should be self-supporting after five or six years, and pay a small dividend to its owner. It would be unreasonable to expect the same tree and the same soil to produce first-class fruit year after year, when not one pennyworth of labor had been bestowed upon it. Under those conditions, it would not pay. It was necessary to give the tree a good start by setting out a strong frame evenly balanced, having, say, four main limbs. Those should be cut back to about 9in. in length. In the second year the new wood should be cut back to 4in. or 5in. In the third year the leading branch should be left 9in. or 10in. long, and the side shoots 4in. Those shoots would give the first return of fruit. It could then be seen whether the tree was able to balance itself. If not, it should be promptly given the necessary help. The tree should not be permitted to become too top heavy, a defect which might be easily remedied by taking out the leading shoots every other year, an operation which would help to force out the fruiting spurs. That process could be continued for years. It was a good plan to keep the tree low, because then it was easier to spray, it was better for the pickers, and the bad effects of the wind were minimised. In renovating old trees, the object was to thin out the worn-out branches or reduce the height of the tree, and care should be taken to make all cuts above side branches. That was very important. A projecting stump should never be left sticking up, because the probabilities were that it would die back. When the tree had lost its foliage, the pruner could see clearly each spur and lateral, and calculate its future value. Winter pruning was better and safer than summer pruning. Experiments in summer pruning showed that apples did well, but suffered from sunburn, and for that reason he was averse to the practice. The best time to prune was from June to the end of August, because the wounds healed over much more quickly and better. If the pruning were too early, too many water shoots would be produced. If large branches required to be removed—but there would be no such necessity if properly pruned from the beginning—they should be cut off in March or April, and covered with tallow or grafting wax. The main limbs of peaches should be so distributed that each limb was shaded and still received plenty of light. Each alternate lateral should be removed, leaving the medium sized and removing the strongest and weakest shoots. All wood that had fruited was thus taken out. Non-bearing trees should be pruned hard, making, say, a 30 per cent. reduction. Some of the runaway roots should also be pruned, which would assist the fruiting in the coming season. It was not possible to grow good fruit from the same soil every year, unless a supply of manure, ashes, lime, or bonedust had been cultivated around the roots of the trees. That was a splendid mixture for giving energy to the trees, and produced a nice dark foliage. Where there was a plentiful supply of rubbish, he recommended burning it and spreading the ashes around the trees. The heavy soil of the hills could not be given too much ashes or lime.

BLACKHEATH, November 10th.—Mr. H. G. Pym read a paper on the working of the Agricultural Bureau, on which considerable discussion took place.

BLACKWOOD, November 20th.—Mr. R. Eglinton read a paper on the diseases of ferrets, in which he indicated the causes and symptoms of distemper, foot rot, and mange or scab.

CHERRY GARDENS, November 7th.—Mr. D. F. Laurie, the Government Poultry Expert, delivered an address on the breeding, feeding, and housing of poultry, and was accorded a hearty vote of thanks and appreciation.

CLARENDON, September 11.—Mr. J. Potter delivered an address on potato growing. He advised a thorough preparation of the soil before planting. Manure from cattle camps was best, and next to that horse manure could be recommended. The paper was well discussed.

FOREST RANGE, September 14th.—Mr. G. Quinn, Horticultural Instructor to the Agricultural Department, gave a lecture and demonstration of pruning and subsequently delivered an address on orchard manuring.

INMAN VALLEY, November 9th.—Mr. G. McCoy read a paper on overstocking, which was freely discussed, members differing as to the carrying capacity of land in the district, some urging that two to three sheep per acre might be carried, whereas others contended that three sheep to two acres would be heavy stocking.

MOUNT BARKER, September 6th.—Mr. H. Pope read a paper on hay and chaff, which he had also read at the Hills Conference, at Morphett Vale.

STRATHALBYN, November 7th.—Discussion took place on a variety of subjects; among others, on the best time for dipping sheep. The opinion was expressed that the extension of time for dipping until January 31st, removed the operation too far from shearing time. Anyone purchasing sheep then, would, if the sheep had not been treated, require to dip them, which was often very inconvenient.

URAIDLA AND SUMMERTOWN, August 7th.—Mr. J. A. Pope read a paper on buying and judging a horse and in dealing, amongst other things, with the feeding of the horse; he said that for a beaten animal gruel was one of the best things. A pint or, if the horse preferred it thick, a quart of oatmeal (or half flour and half cornmeal) should be stirred gradually into a gallon of hot water. The pail should then be filled up with cold water. If the horse hesitated about drinking, it should be given a mouthful of water. If the animal was very tired a quart of good ale would be beneficial, but under no circumstances should a horse be given a feed of grain or hay when exhausted. If the horse would take nothing else, it was well to turn down a bottle of sound ale, and rub it until dry and refreshed. Then it should be fed. A good grooming was nearly equal to half a feed. Mr. F. H. Stacey agreed with the paper in most things. He said that many people gave their horses medicine for complaints which they knew nothing about, and in many cases did more harm than good. Mr. C. W. Kessell said that it was difficult to feed horses regularly in that district, because they worked such irregular hours.

SOUTH-EAST DISTRICT.

GLENCOE (Average annual rainfall, 33.84in.).

October 9th.—Present: seven members and one visitor.

PREPARING WOOL FOR MARKET.—Dealing with the preparation of wool for market, Mr. J. E. Telfer, in a short paper, said that the grower required to make his clip as attractive as possible. All very heavy, matted, and discolored fleeces should be kept out, and as even a class as possible maintained. The wool should be well skirted, all dirty and sweaty edges taken off, and the sides turned in and rolled up from breech to shoulder. Where crossbred sheep were kept it would generally be found that three classes would be necessary, viz., fine, medium, and coarse. When classing wool the length of staple should be taken as a guide. If a fleece were on the fine side and of extra length it would be better to put it in with the coarse line. Care should be taken to keep the wool as clean as possible. No chaff or straw should be allowed to get in it. If a box press were used the wool should be put in carefully and well trampled before commencing to press. Not more than 350lbs. should be put into a bale. They should be branded on the top and on one side with the grower's initials and name of farm, also the description of the wool. The bales should be numbered from the first to the last bale of the clip. Stencil plates should always be used in branding, because they made a much neater brand than that done with a stick or brush. Branding the bales was very important, because the description of the wool was also put in the sale catalogue, and if the description were wrong it very often militated against competition. Mr. J. T. Halliday said that crossbred wool was difficult to class satisfactorily. He had classed his wool in three grades, but the agents had reclassed it into six, and demonstrated that wool which he considered first-class was not so. Mr. G. F. Ferguson said that for flocks of less than 500 sheep it was advisable to make only two classes—coarse, and fine wool—otherwise there would be "star" lots. Mr. A. Dow said that "break" in wool was often caused by bad management. Sheep were starved and then put

on rich feed, which resulted in a break in the wool. Mr. Jas. Barry, in answer to a question, said that some years ago he could not sell his barley, so he bought sheep and fed it to them. They fattened quickly and returned profit equal to a fair price for the grain. Mr. J. Dow said that he had bought some of the same line of sheep as Mr. Barry, but did not give them grain, and whereas Mr. Barry's sheep were sold in prime condition, his (Mr. Dow's) sheep had not improved at all.

KALANGADOO (Average annual rainfall, 33in. to 34in.).

October 14th.—Present: 11 members and one visitor.

MARKING LAMBS.—In considering what age a lamb should attain before the marking operation was carried out, care should be taken, counselled Mr. D. W. Tucker, in a paper on marking lambs, not to take the lamb too young, nor yet to allow it to become too big. Some breeds grew faster than others and could be marked younger. A trial made in marking lambs at four weeks and eight weeks, was in favor of the lambs marked at the later period, and at shearing time they were much bigger and in better condition. Attempts had been made to introduce the searing iron in tailing lambs, but experience showed that the cut healed more readily than the burn. The old style of castration was still the best. The knife should be clean and sharp and the lambs should be allowed a reasonable period in which to cool down after being yarded before being operated upon. Mr. T. Bott said he liked to mark the lambs as young as possible. At three weeks they were old enough. There were fewer losses when the lambs were small. Mr. D. E. Ellison preferred that the lambs should be somewhat older than three weeks. When they were stronger, they mothered much better. Mr. M. Rogers said that the cord should be taken out as perfectly as possible. The purse should be held firmly to prevent the caul fat being broken.

KONGORONG.

November 11th.—Present: 13 members.

SUMMER PLOUGHING FOR SORREL.—In a paper dealing with the destruction of the weed sorrel Mr. F. Kemp said that he ploughed the land in February, and left it turned to the sun without harrowing for five or six weeks. After cultivation it was harrowed and drilled and then harrowed again. A good crop was obtained, the best results being secured from the places where the sorrel had been heaviest. Since then he had not been troubled very much by that weed. He was averse to harrowing after ploughing in that district, because the soil was liable to be blown away if it were at all loose. If it were allowed to remain rough the furrows and ridges afforded protection, and the sun dried up the roots of the sorrel. Mr. C. S. McLean had been troubled with sorrel notwithstanding summer ploughing. Mr. Kemp said that the ploughing should be done before the rain. Mr. F. Uphill inquired whether sorrel which was eaten off before seeding and kept down would die? Mr. T. Dixon said that it would grow as soon as rain fell. Mr. C. S. Atkin said that the spring tooth cultivator dragged the roots to the surface. If land were sown thickly immediately after ploughing and a double dressing of manure given the sorrel would be practically choked out. Mr. H. Aveling said that where sorrel grew the land required lime.

THE HORSE.—Mr. W. A. Aslin delivered an address on the horse, and dealt with the treatment of various ailments.

KYBYBOLITE.

November 9th.—Present: 13 members and three visitors.

CARE OF FARM HORSES.—A member contributed a paper on the care of farm horses, urging firstly the necessity for proper feeding. Working horses should be given three feeds of chaff per day, with oats added, if necessary. At night long hay should be supplied, because it required more mastication, thus aiding digestion and inducing better health. Farmers should keep the best quality hay for their own use, and if rank crops were used, grain should be added. Horses should be watered before feeding. Grooming was essential in improving the horse's condition and maintaining its health, besides tending to prevent sore shoulders, which were frequently the outcome of neglect and carelessness. The collar should fit well and be kept in proper order. Each horse should have its own collar. After a few week's spell, horses should be put to hard work gradually. A good stable was indispensable, with plenty of room for the animal to lie down, and abundance of good straw for bedding.

MANUFACTURE OF CHEMICAL MANURES.—At a previous meeting an address dealing with the manufacture of chemical fertilisers was delivered by Rev. F. W. Brasher, who, after dealing with the sources from which the raw products were obtained, dealt in detail with the process of manufacture. At the close of the address a number of questions were asked, and answered by the speaker.

LUCINDALE (Average annual rainfall, 23.32in.).

October 14th.—Present: 11 members.

CARE AND ATTENTION OF DAIRY COWS.—The care and attention of dairy cows were very important, especially in winter, observed Mr. P. Burke in a paper on that subject. In that district the winters were usually very severe, and unless the cows had some protection they had rather a hard time. Rugging was advisable where the number of cows kept did not exceed three or four, but with more the labor and expense would be too great, and it would be necessary to provide shelter breaks such as pines and other good shelter trees, where the cows could camp on rough nights. Exposure to the cold and rough weather in winter seriously affected the milk and butter supply. The most important factor towards success in dairying was feeding. Provision had to be made for the maintenance of life, and also for the supply of milk, and to do that the cow required the very best food. A good winter fodder was essential, and that could be provided by sowing barley, rye, or oats on well-manured land to catch the early rains in April, or, better still, a small patch should be irrigated. It could be sown in March, and would be fit to cut in May. He preferred feeding off to cutting, because the cow produced more milk and did better when allowed to graze. Lucerne was a splendid fodder for dairy cows, and would grow well in that district with irrigation. Mangolds had proved to be the best food ration to provide a milk and butter supply, but they necessitated much hand labor and were not usually favored. A very important matter was to have the cows coming in at the right time, say April, when milk and butter were scarce. Over-stocking was a grave mistake. Mr. T. W. G. Secker favored rugging cows, because they did much better, and the yield of milk improved. Lucerne was the best fodder for the animals. Mr. J. Burke did not believe in rugging, because when he took the rug off much hair came away with it. He was averse to having all the cows coming in at one time. Mr. J. McInnes said that a good shed where the cows could obtain shelter at night was better than rugs. Mr. L. McInnes said that cows should be kept in as long as possible. He had kept a cow in for five years, and she freshened up every spring and kept in good condition.

MOUNT GAMBIER (Average annual rainfall, 32in.).

October 14th.—Present: 17 members.

TREE PLANTING ON FARMS.—In a paper on this subject Mr. A. A. Kilsby said treeplanting was a great necessity, especially on the flat lands, where they should have a little more shelter for the stock. As a rule the Remarkable pine was the most valuable one to grow. These could be put 6ft. or 8ft. apart, with tree lucerne at the back of them. As the lucerne grew more quickly than the pines, it formed a break for the plantation. In droughty seasons they cut the lucerne down and gave it to the stock. Then the lucerne grew as an undergrowth. On the lighter land, and especially where there was sand drift, they strawed them and planted the pines in the straw. He planted out from 1,500 to 2,000 pines every year. By the time the straw was worn out the pines were up. They firmed the land, and the wind did not have the same effect upon it as it would otherwise have.—Mr. R. P. Pritchard gave approving testimony to the good work that Mr. Kilsby had been doing in the way indicated. He had not thought it was possible to reclaim the sandy land as he had done. He had tried planting rye on sand drifts, and pine trees amongst it. The pines were sheltered by the rye, and came up splendidly. For hills he thought straw would be much better than rye. Mr. D. A. Collins said the nursery officers advised planting sugar gums. At Moorak he thought one of the finest breaks was tree lucerne, planted in a square. The stock could thus get on any side of it. It was also good for shade, and improved the look of a property and enhanced its value. Mr. H. McCormick asked Mr. Kilsby if he allowed the pines to grow their full height, or whether he topped them when they reached a certain altitude. He thought they should be headed down when they were 8ft. or 10ft. high. Then they spread. As for lucerne, he had seen pine trees kill everything near them, and they would kill the lucerne. The best tree for shelter

was the spreading cypress. It grew only 12ft. or 15ft. high, and spread. Mr. Kilsby said that on the good land he would advocate topping the pines, but in the lighter soils he would let them run up. They were a valuable timber. They planted the lucerne almost in the same row as the pines. He had not tried the spreading cypress. It would be difficult to get it to grow out in the paddocks. Mr. McCormick suggested the sheaoak, which was a fine shelter tree.

PROMOTING THE SEEDING OF GRASS.—Mr. H. G. Wheeler read a short paper on the above subject. He said that the result of leaving the grass untouched in one paddock during the spring was that one was seldom if ever short of feed. Most people argued that they would have abundance of green feed, say, that year, as they had drilled in one and a half bushels of oats per acre in their stubble paddocks. That was all very well, but unless there was a good 6in. to 8in. high stubble to protect it, and it was not overstocked previous to drilling, it would be found, unless favored with a good season, that considerable time would elapse before they were able to make use of it to any advantage, and only then by light stocking. By saving a paddock in the spring it could be used early in January, when the seed had ripened, because the stock would then trample sufficient seed out. By taking the stock out for about three weeks, when the autumn rains came, a green feed paddock would be provided, mixed with dry feed, and one that would stand fairly heavy stocking. Some farmers contended that they could not spare a paddock in the spring. What was the reason? Because most farmers were overstocked, and they required all their feed to fatten their stock during the spring. The consequences were that as soon as the spring was over the paddocks were bare again, and were robbed of their seeding. No doubt that was the reason the yields of grass hay were not so prolific as in previous years. One thing he wished to bring forward especially was that they often put stock in paddocks of green feed, and they had to wait two to four months before they could get any benefit from them. They would remember that on the Moorak Estate they fed their bullocks well in the spring, and took them out of the paddocks, and they had excellent feed in the autumn. That year they had not the good autumn rains, but if they had the good autumn rains they used to have the spear grass would be strengthened by the old grass, and then in a fortnight or three weeks after the stock had been taken out they would have good feed.—Mr. A. A. Sassanowsky said they had to consider the different varieties of ground, in order to get a good seeding in the autumn. There must not be too much growth on the ground, or the seeds would not germinate, through insufficient sunlight. He got the best germination where the spring grass was not too thick. Mr. R. Smith thought it depended on the kind of soil. On the good soils they could grow a lot of clover, but it would not pay to let a large quantity of it remain on the ground. It would only rot, and do more harm than good. If they left a light coating of, say, half a ton to the acre, it would be enough shelter for the next year's crop of grass. He did not believe in eating a paddock too bare. Mr. W. Holloway thought the idea of eating out a paddock bare was very poor policy. He had always noticed that where there was at least some grass left on the top, there was a much earlier growth than when it was eaten down bare.

ANALYSES OF SOILS AND LIME.—Mr. Sassanowsky gave a detailed statement of the results of the analyses of soils and lime which were sent to the Agricultural Department about 12 months ago.

MOUNT GAMBIER.

November 11th.—Present: 17 members.

CLOSER SETTLEMENT.—A paper on closer settlement was read by Mr. A. A. Sassanowsky, in the course of which he said that it behoved all who had blocks to see that the land was put to its best advantage for the benefit of the country. He referred to areas from 20 to 40 acres, which were not used for residential purposes only in the district of Mount Gambier. Those small areas were generally taken up with limited capital, and the first few years were a severe struggle for the settler. His first aim should be a quick return on his money, and for that he must look to dairying. It would pay to build a stable so that the cows could be fed. Mr. Suter had pointed out times out of number that it paid to feed the cow, and he had given various rations suitable for all parts of South Australia. The cows were brought up twice a day to be milked, so the one building could do for the same purpose. The cows could be either fed before, after, or whilst milking, and no harm would be done if the cows were groomed, because a clean coat saved feed.

Comparing stable feeding with outside feeding, he said that in stable feeding the cow was under control, and could be fed according to the requirements of her condition. The cow was contented, knowing very well that her neighbor could not rush her, and she could feed at leisure. In outside feeding the food was either scattered on the ground or in boxes, and the cows moved about, the stronger ones robbing the weaker, which were, generally speaking, the best milkers, and that caused double loss—first by trampling the food in the dirt, and, secondly, on account of the weaker getting insufficient food to make milk. They could judge for themselves which was the most economical. The mainstay of the small producer must be the cow; but in conjunction with her the pig, the calf, and the fowls must be looked after. And the same motto would do for them—"Feed them well; look after them well." They would then pay well. The farmer, having made up his mind that dairying was his largest source of income, must grow food, in order to get the most from his land for the cows. In that respect the growing of root crops, such as mangolds, sugar beet, carrots, &c., from which heavy yields might be obtained by good treatment, was advisable. If water for irrigation could be cheaply supplied, the yields could easily be doubled, because those crops were grown in the summer and autumn. A paddock of lucerne might be advisable, but it was rather uphill work to grow it, as the climate in that district was too cold for it to grow successfully. Cereal growing, such as barley, wheat, and oats, was too expensive, because he would require to buy a complete plant that would do for a far larger area, and then run the risks of hot winds and the various pests which were detrimental to the growing of cereal crops. The making of ensilage should be one object that the settler should strive for, and for that purpose some cereal fodders could be grown: but he should take advantage of the natural spring growth of the local grasses, the mixture of which was very adaptable for the making of ensilage at very little expense. It would pay the small farmer better to buy chaff for his horse than grow it. All dry feed required for his herd, except bran or grain, could be made by cutting a paddock of grass for hay. Mr. M. Fahey said to be successful holdings must be subdivided into small paddocks and good fodder plants cultivated. Mangolds and carrots could be grown, but they required a great deal of labor. He preferred chou mollier and lucerne. These could be grown in great quantities if farmers could get water for irrigation at a reasonable rate. But they could not afford to pay 1s. 6d. per 1,000galls. If they could get water at a reasonable rate they could make a great deal more profit out of their land. Mr. H. G. Wheeler advocated giving more care and attention to the cows. If fed in stables they did much better, because the troublesome ones could be tied up and prevented from interfering with the quiet ones. Mr. J. Davidson said that a herd of ten good dairy cows should return from £140 to £150 per annum. Mr. G. H. Kilsby urged the necessity for testing cows. It was no use feeding inferior animals. Food should be preserved for the cow. In the spring they had a wealth of feed, which was wasted, but should be cut and stacked for the season when it was not so plentiful. Mr. J. H. Buck said that dairying was very profitable, but a good bull was a necessity. Mr. J. Keegan commented on the high price of water. Mr. H. McCormick said that under the irrigation rates water could be procured for 6d. per 1,000galls.

MUNDALLA.

November 8th.—Present: 12 members.

FALLOW AT MUNDALLA.—Dividing his subject into three parts, viz., (1) time of starting, (2) depth, and (3) working, Mr. E. Knowling, in a paper on fallow and its treatment at Mundalla, South-East, said that fallowing should be commenced immediately after seeding, July and August being the best months, if it were possible to proceed with the ploughing. The earlier the land was fallowed the less was the liability to takeall. Dry ploughing, unless the weather in the succeeding spring was very favorable, encouraged the development of takeall. The depth varied according to the class of land. In loose land, if by ploughing it very deeply a little clay from the bottom could be brought up and mixed with the upper soil, it would set more firmly and produce a better crop, but if the clay were close to the surface it should not be ploughed too deeply. Only a little clay should be ploughed up each year, and when it was well worked with the upper strata it soon made good soil, but great care should be taken not to bring too much up at a time, otherwise the ground would be too cold in the winter and retard the growth of the crop. From 3in. to 5in. was a good depth for ploughing, according to the class of land. Working should be done before any of the

weeds began to seed, and as dandelions in that district were about the first to seed, the cultivator should be started about the end of September in order to be finished early in October. In the class of land in that district he would not advise harrowing the land before it was cultivated, because it became too fine, and had a tendency to drift in the summer. The spring tooth cultivator was a good implement for working the fallow. The draught was light, and in stumpy land did not jar the shoulders of horses as much as most other implements. Mr. J. E. Staude agreed with Mr. Knowling as to not harrowing the fallow. He had received better returns by only cultivating and not harrowing at all.

NARACOORTE (Average annual rainfall, 22.60in.).

October 14th.—Present: about 33 members.

POINTS WORTH KNOWING ABOUT POULTRY.—In an exhaustive paper on poultry raising by small holders, Mr. E. A. Holmes, after setting out figures indicating the importance of the poultry industry in the United States and Australia, said that the poorest and cheapest land was more adapted to success than high-priced land. Light sandy soil was one of the most suitable, being always free from water lying on the surface. On most farms or small holdings only pure-bred poultry should be used. The male bird that was always crowing, and the hen that was first off the perch in the morning and last to go to roost—always busy—were the birds to breed from. For egg-laying the White Leghorn and Black Orpington (laying strain) stood out from any other, if Government competitions were a guide. Every farmer or breeder should have at least two pens for breeding purposes. A yard, say, 16ft. by 40ft., would accommodate from 15 to 20 hens, which would be sufficient for one male bird. For breeding, the best-shaped, medium-sized eggs should be selected. None that had wrinkles on or showed marks in the shell when held to the light should be used. They rarely hatched. Chicks should not be fed for the first 48 hours. The first feed should be oatmeal for a week, then rolled oats for about two weeks more, then cracked wheat, and at a month whole wheat. Soft feed—pollard 2 parts, bran 1 part, mixed into a crumbly mash—could be given. Young cockerels should be penned away from the pullets when they began to show signs of activity. In fact, the male bird was better kept away from the hens at any time unless required for breeding. An unfertile egg was better in every way, and it would keep any length of time without being turned into what was called the "electioneering" egg. To control breeding chicks must be marked, and toe punching was the best. Hens after they were two seasons old were not profitable, and should not be kept except for breeding purposes. Bone meal was a good thing for growing chicks. It should be mixed up in soft mash, or it could be put in a receptacle to which they could have access whenever they wished. Green cut bone was also one of the best aids for laying hens, but it was not advisable to give it to chicks too young, as it was too forcing. Green feed was absolutely essential to the health of poultry, and especially to growing stock. Any green food was good, but the very best was young tender lucerne. In conclusion he gave a few "don'ts":—Don't set scaly-legged hens, as they will transmit it to the chicks; don't keep weak and weedy chicks, kill them early; don't overcrowd chickens; don't hatch more chicks than you have accommodation for; don't let cockerels run with your laying pullets; don't keep more cockerels than you require, market them; don't keep hens after two years old unless required for breeding; don't let sick fowls run with the flock; don't leave your fowls without shell and flint grit; don't keep drinking water in the hot sun; don't keep green cut bone more than a day before feeding it to the hens; and don't worry a setting hen, but feed and water her. Discussion followed, in which the views expressed in the paper were endorsed. In reply to questions Mr. Holmes said that he did not think there was more disease among pure-bred poultry than among the barn door kind. It was not advisable to mate cockerels and pullets from the same setting, but they could be mated with fresh cockerels or hens. The prolapse of the oviduct was probably caused by over fat from over feeding. The best cross for table birds was the old cross between the Game and the Dorking, but other good crosses were with the Plymouth Rock and White Orpington. It required five or six days after mating of the male and female for eggs to become fertile.